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Revision 0
UC-630, 721

Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility

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HANFORD FACILITY DANGEROUS WASTE PERMIT APPLICATION,
200 AREA EFFLUENT TREATMENT FACILITY

FOREWORD

The Hanford Site is owned by the U.S. Government and operated by the U.S. Department of Energy, Richland Operations Office. Dangerous waste and mixed waste (containing both radioactive and dangerous components) are produced and managed on the Hanford Facility. The dangerous waste is regulated in accordance with the *Resource Conservation and Recovery Act of 1976* and the *State of Washington Hazardous Waste Management Act of 1976* (as administered through the Washington State Department of Ecology *Dangerous Waste Regulations*, Washington Administrative Code 173-303). The radioactive component of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; the nonradioactive dangerous component of mixed waste is interpreted to be regulated under the *Resource Conservation and Recovery Act* and Washington Administrative Code 173-303.

For purposes of the *Resource Conservation and Recovery Act* and the Washington State Department of Ecology *Dangerous Waste Regulations*, the Hanford Facility is considered to be a single facility. The single dangerous waste permit identification number issued to the Hanford Facility by the U.S. Environmental Protection Agency and the Washington State Department of Ecology is U.S. Environmental Protection Agency/State Identification Number WA7890008967. This identification number encompasses over 60 treatment, storage, and/or disposal units within the Hanford Site, hereinafter referred to as the Hanford Facility when cited in the context of the *Resource Conservation and Recovery Act* and the Washington State Department of Ecology *Dangerous Waste Regulations*.

Westinghouse Hanford Company is a major contractor to the U.S. Department of Energy, Richland Operations Office and serves as co-operator of the 200 Area Effluent Treatment Facility, the treatment and storage unit addressed in this permit application documentation.

Westinghouse Hanford Company is identified in the permit application as a 'co-operator' and signs in that capacity. Any identification of Westinghouse Hanford Company as an 'operator' elsewhere in this application is not meant to conflict with Westinghouse Hanford Company's designation as a co-operator but rather is based on Westinghouse Hanford Company's contractual status (i.e., as an operations and engineering contractor) for the U.S. Department of Energy.

The current *Hanford Facility Dangerous Waste Permit Application* is considered to be a single application organized into a General Information Portion (DOE/RL-91-28) and a treatment, storage, and/or disposal Unit-Specific Portion, which includes documentation for individual treatment, storage, and/or disposal units. Both portions consist of a Part A division and a Part B division. The Part B division consists of 15 chapters that address the content of the Part B checklists prepared by the Washington State Department

1 of Ecology (Ecology 1987) and the U.S. Environmental Protection Agency
2 (40 Code of Federal Regulations 270), with additional information requirements
3 mandated by the *Hazardous and Solid Waste Amendments of 1984* and revisions of
4 Washington Administrative Code 173-303. For ease of reference, the Washington
5 State Department of Ecology checklist section numbers, in brackets, follow the
6 chapter headings and subheadings. Documentation contained in the General
7 Information Portion (DOE/RL-91-28) is broader in nature and applies to all
8 treatment, storage, and/or disposal units for which final status is sought.
9

10 In accordance with the preceding discussion, the *200 Area Effluent*
11 *Treatment Facility Dangerous Waste Permit Application* documentation consists
12 of both Part A and a Part B permit application documentation. An explanation
13 of the Part A revisions associated with this treatment and storage unit,
14 including the current revision, is provided at the beginning of the Part A
15 section.
16

17 Once the initial *Hanford Facility Dangerous Waste Permit* is issued, the
18 following process will be used. As final, certified treatment, storage,
19 and/or disposal unit-specific documents are developed, and completeness
20 notifications are made by the U.S. Environmental Protection Agency and the
21 Washington State Department of Ecology, additional unit-specific permit
22 conditions will be incorporated into the *Hanford Facility Dangerous Waste*
23 *Permit* through the permit modification process. All treatment, storage,
24 and/or disposal units that are included in the *Hanford Facility Dangerous*
25 *Waste Permit Application* will operate under interim status until final status
26 conditions for these units are incorporated into the *Hanford Facility*
27 *Dangerous Waste Permit*.
28

29 The *Hanford Facility Dangerous Waste Permit Application, 200 Area*
30 *Effluent Treatment Facility* contains information current as of May 1, 1993.

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ACRONYMS AND ABBREVIATIONS

1		
2		
3		
4	ACI	American Concrete Institute
5	AISC	American Institute of Steel Construction
6	ALARA	as low as reasonably achievable
7	ANSI	American National Standards Institute
8	API	American Petroleum Institute
9	ARI	Air Conditioning and Refrigeration Institute
10	ASME	American Society of Mechanical Engineers
11	ASNT	American Society for Nondestructive Testing
12	ASTM	American Society for Testing and Materials
13	ATP	Acceptance Test Procedure
14	AWS	American Welding Society
15	AWWA	American Water Works Association
16		
17	CFR	Code of Federal Regulations
18		
19	DOE	U.S. Department of Energy
20	DOE-RL	U.S. Department of Energy, Richland Operations Office
21	DST	double-shell tank
22	°C	degrees Centigrade
23	°F	degrees Fahrenheit
24		
25	Ecology	Washington State Department of Ecology
26	EPA	U.S. Environmental Protection Agency
27	ETF	200 Area Effluent Treatment Facility
28		
29	FR	Federal Register
30		
31	HEPA	high-efficiency particulate air
32		
33	IX	ion exchange
34		
35	KEH	Kaiser Engineers Hanford Company
36		
37	LDR	land disposal restriction
38	LERF	Liquid Effluent Retention Facility
39		
40	NACE	National Association of Corrosion Engineers
41	NFPA	National Fire Protection Association
42		
43	OX	oxidation
44		
45	PC	process condensate
46	PDD	process distillate discharge
47	pH	negative concentration logarithm of the hydrogen-ion
48		concentration
49	PNL	Pacific Northwest Laboratory
50	PUREX	plutonium-uranium extraction

ACRONYMS AND ABBREVIATIONS

1		
2		
3		
4	RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
5	RO	reverse osmosis
6		
7	SALDS	State-Approved Land Disposal Site
8		
9	TCLP	toxicity characteristics leaching procedure
10	Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
11	TSD	treatment, storage, and/or disposal
12		
13	UV	ultraviolet
14	UV/OX	ultraviolet oxidation
15		
16	WAC	Washington Administrative Code
17	WSDOT	Washington State Department of Transportation

PART A

This section consists of a Form 1 (not revised) and a Form 3, Revision 1, that describes the 200 Area Effluent Treatment Facility in general terms. In Revision 1, the title of this treatment and storage unit has been changed from the "242-A Evaporator/PUREX Plant Condensate Treatment Facility" to the "200 Area Effluent Treatment Facility" to reflect the expansion of the intended function of this treatment and storage unit.

The 200 Area Effluent Treatment Facility Part A, Form 3, has been revised to add greater than 90-day tank and container storage. This revision adds three 670,000-gallon (2,536,000-liter) verification tanks for greater than 90-day storage because of possible delays in sampling the effluent before discharge to the soil column. The Part A also is being revised to add greater than 90-day container storage because of possible delays in transferring the waste to either the Central Waste Complex or the 616 Nonradioactive Dangerous Waste Storage Facility. The container storage area is designed to store a maximum of 720 55-gallon (208-liter) containers. In addition to adding tank and container storage to the 200 Area Effluent Treatment Facility, four dangerous waste codes were added for treatment process code T01, six dangerous waste codes were added for tank storage process code S02, and 32 dangerous waste codes were added for container storage process code S01. These dangerous waste codes were added in compliance with Washington Administrative Code 173-303-805.

1
2
3
4
5

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FORM

1

State of
Washington
Department
of Ecology

WASHINGTON STATE

DANGEROUS WASTE PERMIT GENERAL INFORMATION

(Read "Form 1 Instructions" before starting)

L. EPA/STATE LD. NUMBER

WA 7090008967

II. NAME OF FACILITY

U.S. DEPARTMENT OF ENERGY - HANFORD SITE

III. FACILITY CONTACT

A. NAME & TITLE (Last, First, & Middle)

LAWRENCE, MICHAEL J., MANAGER

B. PHONE (area code & no.)

509 376 7395

IV. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

P.O. BOX 550

B. CITY OR TOWN

RICHLAND

C. STATE

WA

D. ZIP CODE

99352

V. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

HANFORD SITE

B. COUNTY NAME

BENTON

C. CITY OR TOWN

RICHLAND

D. STATE

WA

E. ZIP CODE

99352

F. COUNTY CODE

005

VI. SIC CODES (4-digit, in order of priority)

A. FIRST

9721 NATIONAL SECURITY

B. SECOND

8922

NUCLEAR NONCOMMERCIAL DEVELOPMENT
AND EDUCATION

C. THIRD

9611 ADMINISTRATION AND GENERAL
ECONOMICS PROGRAM

D. FOURTH

4911

STEAM-ELECTRIC GENERATION

VII. OPERATOR INFORMATION

A. NAME

(DOE-RL)

DEPARTMENT OF ENERGY - RICHLAND OPERATIONS

WESTINGHOUSE HANFORD COMPANY (WHC)

B. Is the name listed in
Part VI-A also the
owner?☐ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter or code the answer box if "Other", specify)

F - FEDERAL
S - STATE
P - PRIVATEM - PUBLIC (other than federal or state)
O - OTHER (specify)

F

D. PHONE (area code & no.)

509 376 7395

E. STREET OR P.O. BOX

PO BOX 550 / PO BOX 1970

509 376 7803

F. CITY OR TOWN

RICHLAND

G. STATE

WA

H. ZIP CODE

99352

VIII. INDIAN LAND

Is this facility located on Indian lands?

☐ YES☒ NO**DOE-RL: OWNER/CO-OPERATOR; WHC: CO-OPERATOR FOR CERTAIN UNITS ON THE HANFORD SITE.
COMPLETE BACK PAGE

IX. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

X. NATURE OF BUSINESS (provide a brief description)

- o NATIONAL DEFENSE NUCLEAR MATERIAL PRODUCTION
- o ENERGY RESEARCH AND TECHNOLOGY DEVELOPMENT
- o DEFENSE NUCLEAR WASTE MANAGEMENT
- o BYPRODUCT STEAM, SOLD FOR ELECTRIC POWER GENERATION

AND SIC 15: BUILDING CONSTRUCTION - GENERAL CONTRACTORS AND OPERATIVE BUILDERS

XI. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (Print or Stamp)

SEE ATTACHMENT

B. SIGNATURE

C. DATE SIGNED

FORM 1

DANGEROUS WASTE PERMIT GENERAL INFORMATION

XI. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

Michael J. Lawrence
Michael J. Lawrence
Manager, Richland Operations
United States Department of Energy

5-19-88
Date

W. M. Jacobi
William M. Jacobi
President
Westinghouse Hanford Company
Co-operator

5/13/88
Date

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 character/inch).

FORM 3	DANGEROUS WASTE PERMIT APPLICATION	1. EPA/STATE I.D. NUMBER <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%;">W</td><td style="width:10%;">A</td><td style="width:10%;">7</td><td style="width:10%;">8</td><td style="width:10%;">9</td><td style="width:10%;">0</td><td style="width:10%;">0</td><td style="width:10%;">0</td><td style="width:10%;">8</td><td style="width:10%;">9</td><td style="width:10%;">6</td><td style="width:10%;">7</td> </tr> </table>	W	A	7	8	9	0	0	0	8	9	6	7
W	A	7	8	9	0	0	0	8	9	6	7			
FOR OFFICIAL USE ONLY														
APPLICATION APPROVED	DATE RECEIVED (mo., day, & yr.)	COMMENTS												
II. FIRST OR REVISED APPLICATION Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or if this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.														
A. FIRST APPLICATION (place an "X" below and provide the appropriate date)														
☐ 1. EXISTING FACILITY (See instructions for definition of "existing" facility. Complete item below.)		☐ 2. NEW FACILITY (Complete item below)												
MO.	DAY	YR.												
FOR EXISTING FACILITIES, PROVIDE THE DATE (mo., day, & yr.) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED (use the boxes to the left)														
MO.	DAY	YR.												
03		93												
FOR NEW FACILITIES, PROVIDE THE DATE (mo., day, & yr.) OPERATION BEGAN OR IS EXPECTED TO BEGIN														
B. REVISED APPLICATION (place an "X" below and complete Section I above)														
☒ 1. FACILITY HAS AN INTERIM STATUS PERMIT		☐ 2. FACILITY HAS A FINAL PERMIT												
III. PROCESSES - CODES AND CAPACITIES														
A. PROCESS CODE - Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process (including its design capacity) in the space provided on the (Section III-C).														
B. PROCESS DESIGN CAPACITY - For each code entered in column A enter the capacity of the process.														
1. AMOUNT - Enter the amount.														
2. UNIT OF MEASURE - For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.														
PROCESS	PRO-CESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY												
Storage:														
CONTAINER (barrel, drum, etc)	S01	GALLONS OR LITERS												
TANK	S02	GALLONS OR LITERS												
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS												
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS												
Disposal:														
INJECTION WELL	D80	GALLONS OR LITERS												
LANDFILL	D81	ACRE-FEET (the volume that would cover one acre to a depth of one foot) OR HECTARE-METER												
LAND APPLICATION	D82	ACRES OR HECTARES												
OCEAN DISPOSAL	D83	GALLONS PER DAY OR LITERS PER DAY												
SURFACE IMPOUNDMENT	D84	GALLONS OR LITERS												
UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE												
GALLONS	G	LITERS PER DAY												
LITERS	L	TONS PER HOUR												
CUBIC YARDS	Y	METRIC TONS PER HOUR												
CUBIC METERS	C	GALLONS PER HOUR												
GALLONS PER DAY	U	LITERS PER HOUR												
Treatment:														
TANK	T01	GALLONS PER DAY OR LITERS PER DAY												
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY												
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR												
OTHER (Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Section III-C.)	T04	GALLONS PER DAY OR LITERS PER DAY												
UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE												
ACRE-FEET	A	HECTARE-METER												
HECTARE-METER	F	ACRES												
ACRES	B	HECTARES												
HECTARES	Q													
EXAMPLE FOR COMPLETING SECTION III (shown in line numbers X-1 and X-2 below): A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.														
LINE NUMBER	A. PRO-CESS CODE (from list above)	B. PROCESS DESIGN CAPACITY	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PRO-CESS CODE (from list above)	B. PROCESS DESIGN CAPACITY	FOR OFFICIAL USE ONLY							
		1. AMOUNT (specify)				1. AMOUNT (specify)								
		2. UNIT OF MEASURE (enter code)				2. UNIT OF MEASURE (enter code)								
X-1	S 0 2	600		5										
X-2	T 0 3	20		6										
	T 0 1	216,000		7										
2	S 0 2	2,010,000		8										
3	S 0 1	39,600		9										
4				10										

Continued from the front.

PROCESSES (continued)

SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESS (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

T01, S02

The 200 Area Effluent Treatment Facility (ETF) is being constructed to treat and store process condensate from the 242-A Evaporator, and the Liquid Effluent Retention Facility, and possibly other Hanford Facility waste that falls within the envelope of acceptable waste at the ETF. The ETF is located in the northeast corner of the 200 East Area. The treatment process includes filtration, pH adjustment, ultraviolet oxidation, hydrogen peroxide decomposition, degasification, reverse osmosis, ion exchange, effluent quality verification in tanks, evaporation, concentration, and thin film drying (T01). The treated effluent is stored in three verification tanks (S02) and sampled to determine if the effluent meets required discharge standards. When the effluent meets the discharge standards as established by the regulations, the effluent will be discharged to the soil. If the sample analysis of the effluent in the verification tanks does not meet the discharge standards, the effluent will be sent back through the system for further treatment.

The treatment process is designed to treat a maximum of 150 gallons (568 liters) per minute or 216,000 gallons (817,650 liters) per day. The tank storage is designed to store a maximum of 2,010,000 gallons (7,610,000 liters).

S01

A secondary waste stream is generated during operation of the ETF. This secondary waste is concentrated into a powder, containerized, and transferred to the Central Waste Complex for storage while disposal options are evaluated. Other mixed waste generated and containerized during the operation of the ETF includes dewatered spent bead resin, spent membranes, spent high-efficiency particulate air cartridges, spent filter elements, spent activated carbon cartridges, and spent ultraviolet lamps. Nonradioactive dangerous waste includes chemicals used in the various processes. This nonradioactive dangerous waste is containerized and transferred to the 616 Nonradioactive Dangerous Waste Storage Facility.

The container storage area is designed to store a maximum of 39,600 gallons (150,000 liters).

IV. DESCRIPTION OF DANGEROUS WASTES

- A. DANGEROUS WASTE NUMBER - Enter the four digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.
- B. ESTIMATED ANNUAL QUANTITY - For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.
- C. UNIT OF MEASURE - For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER - Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

- Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
- In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
- Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

EXAMPLE FOR COMPLETING SECTION IV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 800 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. DANGEROUS WASTE NO. (enter code)				B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)		D. PROCESSES									
	1. PROCESS CODES (enter)							2. PROCESS DESCRIPTION (If a code is not entered in D(1))									
	K	0	5	4	900		P	T	0	3	D	8	0				
X-2	D	0	0	2	400		P	T	0	3	D	8	0				
X-3	D	0	0	1	100		P	T	0	3	D	8	0				
X-4	D	0	0	2				T	0	3	D	8	0				Included with above

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

IV. DESCRIPTION OF DANGEROUS WASTES (continued)											
LINE	A. DANGEROUS WASTE NO. (enter code)				B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES				
							1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (If a code is not entered in D(1))
1	F	0	0	1	657,935,000	P	T01				Treatment - Tank
2	F	0	0	2							
3	F	0	0	3							
4	F	0	0	4							
5	F	0	0	5							
6	W	T	0	2							Included With Above
7	F	0	0	1	67,094,000	P	S02				Storage - Tank
8	F	0	0	2							
9	F	0	0	3							
10	F	0	0	4							
11	F	0	0	5							
12	W	T	0	2							Included With Above
13	D	0	0	1	4,380,000	P	S01				Storage - Container
14	D	0	0	2							
15	D	0	0	3							
16	D	0	0	4							
17	D	0	0	5							
18	D	0	0	6							
19	D	0	0	7							
20	D	0	0	8							
21	D	0	0	9							
22	D	0	1	0							
23	D	0	1	1							
	D	0	1	8							
25	D	0	1	9							
26	D	0	2	2							

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

NUMBER (entered from page 1)

WA 7890008967

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES	
				1. PROCESS CODES (enter)	2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D 0 2 8	4,320,000	P	S01	Storage - Container (cont.)
2	D 0 2 9	(cont.)			
3	D 0 3 0				
4	D 0 3 3				
5	D 0 3 4				
6	D 0 3 5				
7	D 0 3 6				
8	D 0 3 8				
9	D 0 3 9				
10	D 0 4 0				
11	D 0 4 1				
12	D 0 4 3				
13	F 0 0 1				
14	F 0 0 2				
15	F 0 0 3				
16	F 0 0 4				
17	F 0 0 5				
18	W T 0 1	↓	↓	↓	Included With Above
19					
20					
21					
22					
23					
24					
25					
26					

Continued from the front.

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM SECTION D(1) ON PAGE 3.

The ETF treats and stores process condensate from the 242-A Evaporator, and the Liquid Effluent Retention Facility, and possibly other dilute aqueous waste streams generated on the Hanford Facility. The effluent stored in the verification tanks for sampling is regulated as a dangerous waste because of the possible presence of spent halogenated and nonhalogenated solvents (F001 through F005) and for the toxicity of ammonia (WT02, toxic state-only dangerous waste). The secondary waste stream is regulated as a dangerous waste because of the presence of characteristic waste (D001, D002, and D003), toxic constituents (D004, D005, D006, D007, D008, D009, D010, D011, D018, D019, D022, D028, D029, D030, D033, D034, D035, D036, D038, D039, D040, D041, and D043), spent halogenated and nonhalogenated solvents (F001 through F005), and toxic state-only extremely hazardous waste (WT01).

The annual quantity of waste listed under item IV.B was calculated using an operating schedule of 365 days per year. This calculation was done to provide a maximum annual estimated quantity of waste that might be treated and stored by the ETF.

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION

This information is provided on the attached drawings and photos.

LATITUDE (degrees, minutes, & seconds)

LONGITUDE (degrees, minutes, & seconds)

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER

2. PHONE NO. (area code & no.)

3. STREET OR P.O. BOX

4. CITY OR TOWN

5. ST.

6. ZIP CODE

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME (print or type)
John D. Wagoner, Manager
U.S. Department of Energy
Richland Operations Office

SIGNATURE

John D. Wagoner

DATE SIGNED

8/25/93

OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME (print or type)

SIGNATURE

DATE SIGNED

SEE ATTACHMENT

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

Owner/Operator
John D. Wagoner, Manager
U.S. Department of Energy
Richland Operations Office

Date

Co-operator
Thomas M. Anderson, President
Westinghouse Hanford Company

Date

200 Area Effluent Treatment Facility Site Plan

200 Area Effluent Treatment Facility

Block Flow Diagram

200 AREA EFFLUENT TREATMENT FACILITY

46°33'42.33"
119°30'21.70"

93030994-79CN
(PHOTO TAKEN 1993)

PART B

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This Part B permit application documentation for the 200 Area Effluent Treatment Facility consists of 15 chapters and 8 appendices.

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1.0 INTRODUCTION

This chapter briefly describes the permitting approach for the *Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility* (ETF), and provides an overview of the ETF Part B permit application documentation.

The ETF treatment concept originally was coupled with the storage aspect of the Liquid Effluent Retention Facility (LERF) and called the 200 East Area Liquid Effluent Retention and Treatment Facility [March 1990 Notice of Intent (DOE-RL 1990)]. Treatment and storage operations were separated and the treatment portion was called the 242-A Evaporator/Plutonium-Uranium Extraction (PUREX) Plant Condensate Treatment Facility, also referred to as Project C-018H.

Supporting documents refer to the ETF as the C-018H or 242-A Evaporator/PUREX Plant Condensate Treatment Facility. The use of 'C-018H' and '242-A Evaporator/PUREX Plant Condensate Treatment Facility' refers to the ETF.

1.1 200 AREA EFFLUENT TREATMENT FACILITY PERMITTING

The ETF treats mixed waste in tanks and temporarily stores mixed waste in tanks and containers. The ETF is designed to initially treat 242-A Evaporator process condensate (PC); however, this unit also may treat nonregulated waste water, e.g., groundwater. The ETF, located in the 200 East and 600 Areas, is being permitted under interim status expansion. Construction began in March of 1993 and the ETF is expected to come online in October 1994. This permit application documentation is written as if the ETF were operational.

The 242-A Evaporator (DOE/RL-90-42) is one step in an overall treatment process that reduces the volume of waste in the Double-Shell Tank (DST) System (DOE/RL-90-39) and in the single-shell tanks (SST). Tank waste is pumped to the 242-A Evaporator where the waste is concentrated and the overheads are condensed to make the 242-A Evaporator PC. The concentrate is returned to the DST System, and the 242-A Evaporator PC is treated in the ETF.

Treated waste water can be discharged to the soil column in the 600 Area, north of the 200 West Area of the Hanford Facility, following approval of a delisting petition by the U.S. Environmental Protection Agency (EPA) and issuance of a State Waste Discharge Permit by the Washington State Department of Ecology (Ecology).

The treated waste water contains tritium, a radioactive isotope of hydrogen. There is no viable treatment technology available to remove tritium. This document discusses the radioactive and dangerous waste removed from the waste water; however, these discussions do not apply to tritium. The tritium levels are not reduced by the ETF and the discharged water does contain tritium.

1 In addition to the design and operating features of the ETF that are
2 intended to meet the requirements of the *Resource Conservation and Recovery*
3 *Act (RCRA) of 1976* and the Washington Administrative Code (WAC)
4 Chapter 173-303 *Dangerous Waste Regulations*, other design and operating
5 features are necessary to comply with radioactive waste management
6 requirements. Although the treatment, storage, and/or disposal of radioactive
7 waste (i.e., source, special nuclear, and by-product materials as defined by
8 the *Atomic Energy Act of 1954*) is not within the scope of RCRA or WAC 173-303,
9 information is provided for general knowledge where appropriate. The ETF
10 design features and operational practices are intended to keep exposure to
11 radionuclides and dangerous substances as low as reasonably achievable (ALARA)
12 and to provide a disposal system that protects human health and the
13 environment.

14 15 16 **1.2 200 AREA EFFLUENT TREATMENT FACILITY PART B PERMIT** 17 **APPLICATION DOCUMENTATION CONTENTS**

18
19 The ETF Part B permit application documentation consists of the following
20 15 chapters:

- 21
- 22 • Introduction (Chapter 1.0)
- 23 • Facility Description and General Provisions (Chapter 2.0)
- 24 • Waste Characteristics (Chapter 3.0)
- 25 • Process Information (Chapter 4.0)
- 26 • Groundwater Monitoring (Chapter 5.0)
- 27 • Procedures to Prevent Hazards (Chapter 6.0)
- 28 • Contingency Plan (Chapter 7.0)
- 29 • Personnel Training (Chapter 8.0)
- 30 • Exposure Information Report (Chapter 9.0)
- 31 • Waste Minimization (Chapter 10.0)
- 32 • Closure and Postclosure Requirements (Chapter 11.0)
- 33 • Reporting and Recordkeeping (Chapter 12.0)
- 34 • Other Relevant Laws (Chapter 13.0)
- 35 • Certification (Chapter 14.0)
- 36 • References (Chapter 15.0).

37
38 A brief description of each chapter is provided in the following
39 sections.

40 41 42 **1.2.1 Facility Description and General Provisions (Chapter 2.0)**

43
44 This chapter provides a general description of the ETF. A block flow
45 diagram is provided.

46 47 48 **1.2.2 Waste Characteristics (Chapter 3.0)**

49
50 This chapter describes the chemical, biological, and physical
51 characteristics of the waste treated and stored at the ETF. A waste analysis
52 plan for process operation is included. Because dangerous waste does not

1 include the source, special nuclear, and by-product material components of
2 mixed waste, radionuclides are not within the scope of WAC 173-303 or of this
3 permit application documentation. The information on radionuclides is
4 provided only for general knowledge where appropriate.
5
6

7 1.2.3 Process Information (Chapter 4.0) 8

9 This chapter provides a detailed discussion of the ETF processes and
10 equipment. A process flow diagram is provided.
11
12

13 1.2.4 Groundwater Monitoring (Chapter 5.0) 14

15 This chapter explains that the ETF is not operated as a dangerous waste
16 surface impoundment, waste pile, land treatment unit, or landfill. Therefore,
17 groundwater monitoring is not required.
18
19

20 1.2.5 Procedures to Prevent Hazards (Chapter 6.0) 21

22 This chapter discusses hazard prevention and emergency preparedness
23 equipment, structures, and procedures.
24
25

26 1.2.6 Contingency Plan (Chapter 7.0) 27

28 This chapter provides information on contingency planning to ensure that
29 the ETF has measures in place to lessen the potential impact on the human
30 health and the environment in the event of an emergency.
31
32

33 1.2.7 Personnel Training (Chapter 8.0) 34

35 This chapter outlines the training program developed and implemented for
36 ETF employees who have duties associated with dangerous waste management.
37
38

39 1.2.8 Exposure Information Report (Chapter 9.0) 40

41 This chapter explains that the ETF does not store, treat, or dispose of
42 dangerous waste in a surface impoundment or a landfill. Therefore, exposure
43 information is not required.
44
45

46 1.2.9 Waste Minimization (Chapter 10.0) 47

48 This chapter discusses the waste minimization requirements for the ETF.
49
50

1 1.2.10 Closure and Postclosure Requirements (Chapter 11.0)
2

3 This chapter describes the planned activities for closing the ETF. The
4 ETF is to be clean closed. Therefore, no postclosure plan is included.
5

6
7 1.2.11 Reporting and Recordkeeping (Chapter 12.0)
8

9 This chapter summarizes commitments for reporting and recordkeeping that
10 are applicable to the ETF.
11

12
13 1.2.12 Other Relevant Laws (Chapter 13.0)
14

15 This chapter discusses federal and state laws that govern the ETF
16 construction and operation, other than the RCRA, as amended, and the *State of*
17 *Washington Hazardous Waste Management Act of 1976*, as amended.
18

19
20 1.2.13 Certification (Chapter 14.0)
21

22 This chapter contains the required certification signed by officials of
23 the U.S. Department of Energy, Richland Operations Office (DOE-RL) indicating
24 that the information provided is true, accurate, and complete.
25

26
27 1.2.14 References (Chapter 15.0)
28

29 References used throughout this Part B permit application documentation
30 are listed in this chapter. All references listed here, which generally are
31 not available from other sources, will be made available for review, upon
32 request, to any regulatory agency or public commentor. References can be
33 obtained by contacting the following:
34

35 Administrative Records Specialist
36 Public Access Room H6-08
37 Westinghouse Hanford Company
38 P.O. Box 1970
39 Richland, Washington 99352.
40

41
42 1.3 ACRONYMS AND ABBREVIATIONS
43

44 Acronyms and abbreviations used throughout this Part B permit application
45 documentation are located at the beginning of the document between the
46 Foreword and the Part A permit application section.
47

1 **1.4 DEFINITIONS**
2

3 Definitions specific to this permit application documentation are
4 provided in this section. These definitions supplement those provided in
5 WAC 173-303-040.
6

7 **Contractor**--Firm under contract to the U.S. Department of Energy to provide
8 Hanford Site services. Currently, there are the following four Hanford Site
9 prime contractors:

- 10
11
 - 12 • An Operations and Engineering contractor
 - 13 • A Research and Development contractor
 - 14 • An Engineer and Construction contractor
 - 15 • A Medical Health Services contractor.

16 Throughout the remainder of this permit application documentation, the
17 term contractor, except where specified, is used to refer to the operations
18 and engineering contractor. The use of the word 'operations' in 'operations
19 and engineering contractor' is a contractual term, and is unrelated to the
20 word 'operator' as defined by RCRA and WAC 173-303.
21

22 **Dangerous or hazardous waste**--In addition to the definition in
23 WAC 173-303-040, means the nonradioactive dangerous component of waste
24 commonly called mixed waste (i.e., waste that is both dangerous and
25 radioactive). Dangerous waste commonly is used to refer to hazardous,
26 dangerous, or extremely hazardous waste within this permit application
27 documentation.
28

29 **Facility**--Dependent on context, the term 'facility', as used in this permit
30 application documentation, could refer to:

- 31
32
 - 33 • The Hanford Facility (refer to definition)
 - 34 • Building nomenclature commonly used at the Hanford Facility. In this
35 context, the term 'facility' remains as part of the title for various
36 treatment, storage, and/or disposal (TSD) units (e.g., Grout Treatment
37 Facility, and 616 Nonradioactive Dangerous Waste Storage Facility)
 - 38 • For purposes of complying with RCRA corrective action provisions, all
39 contiguous property under the control of the owner or operator seeking
40 a permit under Subtitle C of RCRA.
41

42
43 **Generating Unit**--Term inferred to have the same meaning as 'generator' as
44 defined in WAC 173-303-040. For purposes of the RCRA and the *Dangerous Waste*
45 *Regulations*, the Hanford Facility is considered to be a single generator
46 comprised of a number of generating units.
47

48 **Hanford Facility**--A single RCRA facility identified by the EPA/State
49 Identification Number WA7890008967 that consists of over 60 TSD units
50 conducting dangerous waste management activities. These TSD units are
51 included in the *Hanford Facility Dangerous Waste Part A Permit Application*
52 (DOE/RL-88-21). The Hanford Facility consists of the contiguous portion of

1 the Hanford Site that contains these TSD units and, for the purposes of the
2 RCRA, is owned by the U.S. Government and operated by the DOE-RL (excluding
3 lands north and east of the Columbia River, river islands, lands owned or used
4 by the Bonneville Power Administration, lands leased to the Washington Public
5 Power Supply System, and lands owned by or leased to the state of Washington).

6
7 Hanford Site--The approximately 560 square miles (1,450 square kilometers) in
8 southeastern Washington State owned by the U.S. Government and sometimes
9 referred to as the Hanford Reservation.

10
11 Treatment, Storage, and/or Disposal Unit--A unit used for treatment, storage,
12 and/or disposal of dangerous waste that is required to be permitted and/or
13 closed pursuant to RCRA and WAC 173-303 requirements as determined in the
14 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement)
15 Action Plan (Ecology et al. 1992). Also refers to a grouping of TSD units for
16 the purpose of preparing and submitting a permit application pursuant to the
17 requirements under RCRA and WAC 173-303, as determined in the Tri-Party
18 Agreement Action Plan.

19
20 Tri-Party Agreement--The term Tri-Party Agreement means the *Hanford Federal*
21 *Facility Agreement and Consent Order*, dated May 1989, as amended, and as it
22 may be amended from time to time, including the Tri-Party Agreement Action
23 Plan incorporated in the Tri-Party Agreement.

24 25 26 1.5 PERMIT MODIFICATIONS

27
28 All modifications to the ETF Unit-Specific Portion of the Hanford
29 Facility Permit will be made in accordance with the requirements identified in
30 WAC 173-303-830, with the following exception. The notifications required by
31 WAC 173-303-830(4)(a)(i)(A) and (B) for Class 1 changes will be submitted
32 annually to the required regulatory agencies, appropriate units of state and
33 local government, and individuals on the facility mailing list maintained by
34 Ecology. These notifications will be submitted by March 1 of each year.

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APPENDIX

2A	LOCATION MAPS	APP 2A-1
----	-------------------------	----------

2.0 FACILITY DESCRIPTION AND GENERAL PROVISIONS [B]

This chapter briefly describes the ETF location and operational information, including the following:

- General description
- Topography
- Location information
- Traffic information
- Performance standards
- Buffer monitoring zones
- Spills and discharges
- Manifest system.

A more detailed discussion of the waste types treated and the identification of the processes and equipment are provided in Chapters 3.0 and 4.0, respectively. Because dangerous waste does not include the source, special nuclear, and by-product material components of mixed waste, radionuclides are not within the scope of WAC 173-303 or of this permit application documentation. The information on radionuclides is provided only for general knowledge where appropriate.

2.1 DESCRIPTION OF THE 200 AREA EFFLUENT TREATMENT FACILITY

The ETF is located in the 200 East Area and 600 Area (Figures 2-1 and 2-2). Appendix 2A provides a general overview of the Hanford Facility (Drawing H-6-958), and illustrates the following:

- Legal boundary
- Contours [at 20-foot (6.1 meter) intervals] sufficient to show surface water flow
- Fire control services
- Access roads, internal roads, railroads, perimeter gates, and barricades
- Longitudes and latitudes.

The purpose of the ETF is to receive and treat the 242-A Evaporator PC, the contents of the LERF, and possibly other Hanford Facility waste that falls within the envelope of acceptable waste as described in Chapter 3.0.

This permit application documentation is to permit the ETF treatment systems, including ancillary equipment and piping, from the surge tank to the verification tanks, and transfer piping connecting the LERF to the ETF. This permit application documentation does not include piping from the 242-A Evaporator to the LERF, nor does it include the piping from the ETF to the State-Approved Land Disposal Site (SALDS) in the 600 Area, north of the

1 200 West Area. The piping from the 242-A Evaporator to the LERF should be
2 included in permit application documentation for the LERF, and the pipeline to
3 the SALDS will be non-RCRA upon approval of the delisting petition.
4

5 The ETF consist of two treatment processes, called treatment trains, a
6 primary and a secondary train (Figure 2-3). Incoming waste water to the ETF
7 is referred to as 'waste water'; the effluent leaving the ETF is referred to
8 as 'treated waste water'. Within the treatment trains, the waste water
9 entering an individual treatment system is called 'feed' and the waste exiting
10 a treatment system is called 'discharge'. The primary treatment train removes
11 most radioactive and dangerous waste from the waste water. Treated waste
12 water is then discharged to the soil column in the 600 Area, north of the
13 200 West Area. The secondary treatment train processes the waste removed by
14 the primary treatment train. The secondary waste is dried to a powder,
15 containerized, and transferred to a TSD unit.
16

17 Each treatment train consists of a series of connected treatment systems
18 (Chapter 4.0 describes the treatment trains in detail). The ETF uses
19 skid-mounted, commercially available, modular treatment systems wherever
20 possible. The primary treatment train consists of the following systems:
21

- 22 • Surge tank
- 23 • Rough filter
- 24 • Ultraviolet oxidation (UV/OX)
- 25 • pH adjustment
- 26 • Hydrogen peroxide decomposer
- 27 • Fine filter
- 28 • Degasification
- 29 • Reverse osmosis (RO)
- 30 • Polisher [ion exchange (IX) column]
- 31 • Final pH adjustment and verification.
32

33 The secondary treatment train processes waste removed from the waste
34 water in the primary treatment train. The secondary treatment train consists
35 of the following:
36

- 37 • Secondary waste receiving tanks
- 38 • ETF evaporator (forced circulation evaporator)
- 39 • Concentrate tank
- 40 • Thin film dryer
- 41 • Container handling
- 42 • Supporting systems.
43

44 The following sections provide a general description of the ETF system
45 components.
46

47 2.1.1 Transfer Piping System 48 49

50 Waste water from the 242-A Evaporator and the LERF is pumped to the ETF
51 surge tank through two pipelines. Waste water from other TSD units and

1 non-RCRA regulated sources, e.g., groundwater, may be treated at the ETF in
2 the future. The mechanism for accepting waste other than from the
3 242-A Evaporator or the LERF has not been identified.
4
5

6 2.1.2 Primary Treatment Train 7

8 The purpose of the primary treatment train is to remove contaminants from
9 the waste water so that the treated waste water can be discharged to the soil
10 in compliance with a Washington State waste discharge permit. The primary
11 treatment train consists of the components described in the following
12 sections. Detailed descriptions are provided in Chapter 4.0.
13

14 2.1.2.1 Surge Tank. Waste water from the 242-A Evaporator and the LERF is
15 delivered by way of pipelines into the surge tank. The surge tank also
16 receives some waste generated during the treatment process. The pH of the
17 waste water is adjusted in the surge tank.
18

19 2.1.2.2 Rough Filter. The waste water from the surge tank is fed to the
20 rough filter. A backwashable 2-micron filter element is used to remove coarse
21 suspended solids.
22

23 2.1.2.3 Ultraviolet Oxidation System. The UV/OX system decomposes organic
24 constituents in the filtered waste water.
25

26 The waste water is mixed with hydrogen peroxide in the UV/OX system, then
27 flows past long, cylindrical UV light tubes. The UV light reacts with the
28 hydrogen peroxide creating 'hydroxyl radicals'. The UV light and the hydroxyl
29 radicals together destroy the organic materials in the waste water.
30

31 2.1.2.4 pH Adjustment Tank. The pH is adjusted to (1) convert ammonia into
32 an ammonium ion that can be removed by the RO system and (2) lower the
33 solubility of carbonate ion allowing carbon dioxide to be released in the
34 degasification system.
35

36 2.1.2.5 Hydrogen Peroxide Decomposer. The hydrogen peroxide decomposer
37 reduces the level of hydrogen peroxide in the waste water to avoid damaging
38 other systems in the treatment train.
39

40 2.1.2.6 Fine Filter. A backwashable 0.5-micron filter element is used for
41 removal of suspended solids from the waste water.
42

43 2.1.2.7 Degasification System. The function of the degasification system is
44 to prevent the formation of carbonate by removing carbon dioxide from the
45 waste water. If left in the waste water, carbonate would increase the chance
46 of fouling the RO system, the polisher, and equipment in the secondary
47 treatment train.
48

49 2.1.2.8 Reverse Osmosis System. The function of the RO system is to reduce
50 the concentration of dissolved solids, radionuclides, and any remaining large
51 organic materials in the waste water.
52

1 The RO system consists of cylinders containing membranes that work like
2 filters. The membranes are of a composite polyamide type. Waste water passes
3 through the membranes leaving behind waste materials, called concentrate. The
4 waste water discharged from the system, called permeate, continues on to the
5 polisher.
6

7 2.1.2.9 Polisher. Three IX columns with mixed beds of cation and anion
8 resins remove the remaining dissolved solids from the waste water. In normal
9 operation, two of the three IX columns are used in series for dissolved solids
10 removal, and the third IX column is isolated from the treatment line for
11 regeneration.
12

13 2.1.2.10 Effluent pH Adjustment Tank. The waste water pH is adjusted for the
14 final time within the range of 6.5 to 8.5.
15

16 2.1.2.11 Verification Tanks. The treated waste water is held in the
17 verification tanks while a sample is analyzed to ascertain that discharge
18 limits have been achieved. The waste water sample is taken between the final
19 pH adjustment tank and the verification tanks. The treated waste water is
20 pumped back into the treatment train for additional treatment if the analysis
21 shows that the water exceeds the state waste discharge permit limits.
22

23 Of the three verification tanks, one tank receives the waste water from
24 the pH adjustment tank, one tank is used for verifying that treatment limits
25 have been met, and one tank feeds the treated waste water that has been
26 approved for discharge to the SALDS. Each tank has a capacity of
27 670,000 gallons (2,536,218 liters), which represents 72 hours of operational
28 flow at 150 gallons (568 liters) per minute.
29

30 Some treated waste water from the verification tanks is used within
31 various systems in the ETF to minimize the addition of fresh water.
32
33

34 2.1.3 Secondary Treatment Train 35

36 The purpose of the secondary treatment train is to process waste (e.g.,
37 primarily inorganic compounds and radionuclides) removed from the waste water
38 in the primary treatment train. The secondary treatment train consists of the
39 components described in the following sections.
40

41 2.1.3.1 Secondary Waste Receiving Tank. Liquid waste removed from the waste
42 water in the primary treatment train is collected in two secondary waste
43 receiving tanks. The main sources of secondary waste are the backwash from
44 the rough and fine filters, the reject stream from the first RO stage, and
45 regeneration waste from the polisher. During the feed mode, a sample is taken
46 from the recirculation line to ensure that the concentration factor for the
47 ETF evaporator is appropriate.
48

49 2.1.3.2 Effluent Treatment Facility Evaporator. The ETF evaporator
50 concentrates, by evaporation, the waste in preparation for drying. This
51 evaporator system was selected to reduce energy consumption.
52

1 **2.1.3.3 Concentrate Tank.** The concentrate generated by the ETF evaporator is
2 alternately discharged to one of two concentrate tanks. One tank receives the
3 concentrate from the ETF evaporator while the other tank feeds material to the
4 thin film dryer.
5

6 A sample of the liquid is taken from the concentrate tank to characterize
7 the waste before it is dried. Analysis of the liquid provides a conservative
8 and complete characterization of the powdered waste. Worker exposure and
9 contamination are minimized by avoiding handling the powdered waste.
10

11 **2.1.3.4 Thin Film Dryer.** The purpose of the thin film dryer system is to dry
12 the concentrated waste to a powder and then drop the powder into 55-gallon
13 (208-liter) lined containers for short-term storage before transfer to a
14 TSD unit.
15

16 **2.1.3.5 Container Handling System.** Empty 55-gallon (208-liter) containers
17 with liners and lids are positioned under the dryer powder hopper and filled.
18 The container is filled to a predetermined weight and then capped.
19

20 **2.1.3.6 Filled Container Storage.** The storage area meets secondary
21 containment requirements for storing dry and liquid mixed waste. Containers
22 are stored temporarily until transported for long-term storage or disposal.
23

24 **2.1.4 Supporting Systems**

25 The supporting systems for the ETF consist of the chemical reagent feed
26 system, sump tank system, vessel offgas system, and utilities.
27

28 **2.1.4.1 Chemical Reagent Feed System.** The chemical reagent feed system
29 provides solutions of 92 weight percent and 4 weight percent sulfuric acid and
30 50 weight percent and 4 weight percent sodium hydroxide to various points in
31 the treatment process.
32

33 The 92 weight percent sulfuric acid and 50 weight percent sodium
34 hydroxide are delivered by trucks to the ETF. These chemicals are stored in
35 the 92 weight percent sulfuric acid storage tank and the 50 weight percent
36 sodium hydroxide storage tank located outside, on the south side of the ETF
37 Building.
38

39 The 92 weight percent sulfuric acid and the 50 weight percent sodium
40 hydroxide are pumped directly to the surge tank.
41

42 In the dilute chemical storage tanks, 92 weight percent sulfuric acid and
43 50 weight percent sodium hydroxide are diluted by treated waste water from the
44 verification tanks to produce 4 weight percent solutions in each tank. The
45 acid and base solutions are distributed to the pH adjustment tank, effluent pH
46 adjustment tank, secondary waste receiving tanks, concentrate tanks, and for
47 regeneration of the polisher by dedicated pumps.
48
49
50

2.1.4.2 Sump Tank System. Overflow, pressure valve release, and spilled waste are collected in two sump tanks. Collected liquids are transferred to the surge tank.

2.1.4.3 Vessel Offgas System. The vessel offgas system provides air emissions control for the treatment process. Vessel offgas from various sources is treated through a vessel offgas filter.

2.1.4.4 Utilities. The ETF is supplied with the following utility systems: raw water, cooling water, steam, compressed air, seal water for pumps, and demineralized water.

2.2 TOPOGRAPHIC MAPS [B-2]

A topographic map (H-13-000081), showing a distance of at least 1,000 feet (305 meters) around the ETF, is provided in Appendix 2A. This map is drawn at a scale of 1 inch equals 180 feet (1 centimeter equals 20 meters). The contour interval (1.6 feet or 0.5 meter) clearly shows the pattern of surface water flow in the vicinity of the ETF. The map contains the following information:

- Map scale
- Date
- Prevailing wind speed and direction
- A north arrow
- Surrounding land use
- Access road location
- Access control.

2.3 LOCATION INFORMATION [B-3]

This section describes the location of the ETF in relation to seismic, floodplain, and shoreline considerations.

2.3.1 Seismic Consideration [B-3a]

The ETF is located in Zone 2B as identified in the *Uniform Building Code* (ICBO 1991). The ETF was designed in accordance with the regulations of Section 2312 of the *Uniform Building Code* (ICBO 1991) for earthquake Zone 2. The design of the ETF for seismic considerations is in accordance with the *Hanford Plant Standards*, Standard Design Criteria - 4.1 (DOE-RL 1988a). This plant standard provides seismic load criteria specific for the Hanford Site and is more restrictive than the *Uniform Building Code*.

No active faults, or evidence of a fault that has had displacement during Holocene times, have been found at the Hanford Site (DOE 1988; WHC 1991). The youngest faults recognized at the Hanford Site occur on Gable Mountain, approximately 1 air-mile (1.6 kilometers) north of the 200 East Area [well

over 500 feet (152 meters) from the ETF]. These faults are of Quaternary age and are considered 'capable' by the Nuclear Regulatory Commission (NRC 1982).

2.3.2 Floodplain Standard [B-3b]

Three sources of potential flooding of the ETF were considered: (1) the Columbia River, (2) the Yakima River, and (3) storm-induced run-off in ephemeral streams draining the Hanford Facility. No perennial streams occur in the central part of the Hanford Facility.

The Federal Emergency Management Agency has not prepared floodplain maps for the Columbia River through the Hanford Site. The flow of the Columbia River largely is controlled by several upstream dams that are designed to reduce major flood flows. Based on a U.S. Army Corps of Engineers study of the flooding potential of the Columbia River that considered historic data and water storage capacity of the dams on the Columbia River (COE 1969), the U.S. Department of Energy (ERDA 1976) has estimated the probable maximum flood (Figure 2-4). The estimated probable maximum flood would have a larger floodplain than either the 100- or 500-year flood. The ETF is well above the elevation of the Columbia River probable maximum flood and, therefore, is not within the 100- or 500-year floodplain.

The 100-year floodplain for the Yakima River, as determined by the Federal Emergency Management Agency (FEMA 1980), is shown in Figure 2-5. The ETF is not within this floodplain.

The only other potential source of flooding of the ETF is run-off from a large precipitation event in the Cold Creek watershed. This event could result in flooding of the ephemeral Cold Creek. Skaggs and Walters (1981) have estimated the probable maximum flood using conservative values of precipitation, infiltration, surface roughness, and topographic features. The resulting Cold Creek flood area (Figure 2-6) would not affect the ETF. The 100-year flood would be less than the probable maximum flood.

2.3.2.1 Demonstration of Compliance [B-3b(1)]. The ETF is not located within a 100-year floodplain. Therefore, no demonstration of compliance is required.

2.3.2.1.1 Flood Proofing and Flood Protection Measures [B-3b(1)(a)]. The ETF is not located within a 100-year floodplain. Therefore, no demonstration of compliance is required.

2.3.2.1.2 Flood Plain [B-3b(1)(b)]. The ETF is not located within a 100-year floodplain. Therefore, no demonstration of compliance is required.

2.3.2.2 Plan for Future Compliance with Floodplain Standard [B-3b(2)]. The ETF is not located within a 100-year floodplain. Therefore, no demonstration of compliance is required.

1 **2.3.3 Shoreline Standard [B-3c]**
2

3 The ETF is not located within regulated 'shorelines of the state' or
4 'wetlands' as defined in the *Shoreline Management Act of 1971*. The ETF is
5 located on the Hanford Facility, which is owned by the U.S. Government and
6 operated by the DOE-RL. The Hanford Site is not classified as natural,
7 conservancy, rural, or residential.
8
9

10 **2.3.4 Sole Source Aquifer Criteria [B-3d]**
11

12 The ETF is not located over a 'sole-source' aquifer as defined by
13 Section 1424(e) of the *Safe Drinking Water Act of 1974*. Therefore, no
14 demonstration of compliance is required.
15
16

17 **2.4 TRAFFIC INFORMATION [B-4]**
18

19 The regional highway network traversing the Hanford Site (Washington
20 State Highways 24 and 240), nonrestricted access roadways (Route 10 and
21 portions of Route 4S located south of the Wye Barricade), and the restricted
22 access roadways are shown in Figure 2-7.
23

24 Roadways on the Hanford Site east of the Yakima Barricade and north of
25 the Wye Barricade, and within the 300 and 400 Areas, are restricted to
26 authorized personnel only. Other U.S. Department of Energy roadways are
27 subject to such restrictions or closure as the U.S. Department of Energy might
28 require. Estimated traffic volumes, in vehicles per day, are shown in
29 Figure 2-7. The majority of traffic is passenger vehicles used for commuting
30 and conducting company business. Approximately 10 percent of the traffic
31 volume is trucks, and these trucks are mainly delivery, construction, and
32 maintenance vehicles.
33
34

35 **2.4.1 Hanford Site Roadways**
36

37 Drawing H-6-958 in Appendix 2A and Figure 2-7 show the major roads
38 through the Hanford Site. These roads are classified as either primary or
39 secondary routes. The primary routes include Routes 4N, 4S, 10, 2N, 3, 6,
40 and 11A, as well as various avenues within each area. The primary routes are
41 constructed of bituminous asphalt [usually 2 inches (5.08 centimeters) thick,
42 but the thickness of the asphalt layer will vary with each road] with an
43 underlying aggregate base in accordance with U.S. Department of Transportation
44 requirements. The secondary routes are constructed of layers of an oil and
45 rock mixture with an underlying aggregate base. The aggregate base consists
46 of various types and sizes of rock found onsite. Currently, no load-bearing
47 capacities of these roads are available; however, loads as large as 140 pounds
48 per square inch (9.87 kilograms per square centimeter) have been transported
49 without observable damage to road surfaces. All roads meet the requirements
50 for the American Association of State Highway and Transportation
51 Officials HS-20-44 load rating (AASHTO 1983). An HS-20-44 loading represents

1 a two-axle tractor [front axle loading of 8,000 pounds (3,633 kilograms) and
2 rear axle loading of 32,000 pounds (14,535 kilograms)] plus a single-axle
3 trailer with a 32,000-pound (14,535-kilogram) axle loading.
4
5

6 2.4.2 Traffic Control Signs, Signals, and Procedures 7

8 Standard traffic control signs are used throughout the Hanford Site
9 (e.g., hexagonal stop signs, triangular yield signs). Speed limits are posted
10 throughout the Hanford Site, and the maximum posted speed is 55 miles
11 (88 kilometers) per hour on major thoroughfares. Inside the various areas,
12 posted speeds are reduced to a maximum of 35 miles (56 kilometers) per hour
13 and held to speeds as low as 15 miles (24 kilometers) per hour.
14
15

16 2.4.3 Transfer of Waste 17

18 Waste from the 242-A Evaporator and the LERF is transferred to the ETF
19 via pipelines. Dangerous and mixed waste generated by the ETF, including
20 powdered waste, dewatered spent resin, and maintenance waste (such as spent
21 filter media, RO membranes, and UV lamps) is placed in containers and
22 transported to a TSD unit.
23

24 The transport of dangerous and/or mixed waste is performed in accordance
25 with applicable onsite shipping requirements. Although onsite waste transfers
26 are exempt from the manifest requirements of WAC 173-303-370, onsite waste
27 tracking is applied as a matter of good management practice. These onsite
28 shipping requirements are designed to ensure that personnel exposures are
29 maintained ALARA, that loss of contamination control is prevented, and that
30 applicable transportation regulations are obeyed. Information on the
31 transport of dangerous and/or mixed waste is provided for general knowledge.
32
33

34 2.5 PERFORMANCE STANDARDS [B-5] 35

36 The ETF is designed to minimize the exposure of personnel to dangerous
37 waste and hazardous substances and to prevent dangerous waste and hazardous
38 substances from reaching the environment. In addition, measures are taken to
39 ensure that the ETF is maintained and operated in a manner that prevents the
40 following:
41

- 42 • Degradation of groundwater quality
- 43
- 44 • Degradation of air quality
- 45
- 46 • Degradation of surface water quality
- 47
- 48 • Destruction or impairment of flora or fauna outside of the ETF
- 49
- 50 • Excessive noise
- 51

- Negative aesthetic impacts
- Unstable hillsides or soils
- Use of processes that do not treat, detoxify, recycle, reclaim, and recover waste material to the extent economically feasible
- Endangerment to the health of employees or the public near the ETF.

The measures taken to prevent each of the negative effects from occurring are described in the following sections.

2.5.1 Measures to Prevent Degradation of Groundwater Quality

The ETF is designed to prevent significant degradation of groundwater quality. Degradation of groundwater quality is prevented primarily through tank and ancillary equipment secondary containment, with leak detection between the primary and secondary containment systems. The secondary containment and other pertinent systems designed to prevent releases to groundwater are described in detail in Chapter 4.0.

2.5.2 Measures to Prevent Degradation of Air Quality by Open Burning or Other Activities

No open burning occurs at the ETF. The arid climate limits vegetation within the boundaries of the Hanford Site. The vegetation is removed routinely so that almost no potential exists for accidental open burning. Transfer lines are underground and would not be impacted by accidental open burning. Ventilation systems (described in Chapter 4.0) control air emissions from the tanks and ancillary equipment. Control of air emissions regulated by RCRA are discussed in Chapter 4.0. Appropriate air permit applications have been submitted for monitoring and controlling air emissions.

2.5.3 Measures to Prevent Degradation of Surface Water Quality

The ETF prevents degradation of surface water by not discharging dangerous waste to the environment, and by the use of secondary containment of tanks and ancillary equipment. Measures to prevent releases to the environment are discussed in detail in Chapter 4.0. There is no surface water in proximity to the ETF; the nearest surface water (the Columbia River) is approximately 6 air miles from the ETF.

2.5.4 Measures to Prevent Degradation of or Impairment of Flora and Fauna Outside the Unit

The existing areas used for mixed and dangerous waste management at the Hanford Facility already have undergone some environmental modification, and the additional impact on plants and wildlife from ETF operations is minimal

1 (DOE 1987). Plant and animal communities have undergone temporary disruption
2 during construction phases, but operation of the ETF does not result in any
3 significant impact to plant and wildlife communities or to their habitats.
4

5 The security fences in the 200 Areas serve as a barrier to large land
6 animals and, therefore, limit these animals from accessing the ETF operations.
7

8 9 **2.5.5 Measures to Prevent Excessive Noise**

10
11 Nearly all operations are located within the ETF, thus preventing
12 excessive noise to the surrounding environment. The only noise to the outside
13 environment is that of heating, ventilation, and air conditioning blowers and
14 occasional pump noises, typical for a building of this size in an industrial
15 setting. There are no nearby residential and industrial areas (Figure 2-1)
16 that could be disturbed by noise.
17

18 19 **2.5.6 Measures to Prevent Negative Aesthetic Impact**

20
21 The ETF was constructed to prevent negative aesthetic impact. The design
22 of the ETF provides for an orderly arrangement of load-in and load-out areas.
23 Areas affected by construction were stabilized with gravel to prevent soil
24 erosion. The ETF and all exterior operations are painted or constructed with
25 noncorrosive materials.
26

27 28 **2.5.7 Measures to Prevent Unstable Hillsides or Soils**

29
30 There are no naturally unstable hillsides or soils near the ETF. The
31 climate is arid to semiarid as a result of being in the rain shadow of the
32 Cascade Mountain Range. The Hanford Site is blanketed by a thin veneer of
33 wind-blown sediments. Vegetation on the ETF site consists of sagebrush and
34 other common central Washington desert plant species. The soil is classified
35 as sandy gravel with excellent drainage characteristics. Water erosion on the
36 plateau is minor because of the minimal precipitation, high soil porosity, and
37 relatively flat topography.
38

39 40 **2.5.8 Measures to Prevent the Use of Processes that Do Not Treat,** 41 **Detoxify, Recycle, Reclaim, and Recover Waste Materials to** 42 **the Extent Economically Feasible**

43
44 The ETF treats, detoxifies, recycles, and reclaims waste materials to the
45 extent economically feasible. A detailed description of the ETF process is
46 provided in Chapter 4.0.
47
48

1 **2.5.9 Measures to Prevent Endangerment to the Health of Employees**
2 **or the Public Near the Unit**
3

4 Human health and the environment are protected primarily by the use of
5 double containment, the isolation of the ETF, and the distance groundwater
6 must travel to reach drinking water supplies. Employee and public protection
7 are enhanced further by administrative measures, i.e., fences, security.
8

9 The overall goal is to limit radiation and chemical exposure to ALARA.
10 A combination of features was used in the design and is used in the operation
11 of the ETF to ensure stringent confinement of radioactive and dangerous
12 materials. The principal preventive measures include the use of shielding,
13 maximizing the distance from radiation sources, restricting the time of
14 occupancy in radiation zones, and using protective clothing. Employee
15 training includes dangerous materials and waste awareness, emergency response,
16 and workplace safety (Chapter 8.0). Protective equipment, safety data, and
17 hazardous materials information are readily available for employee use.
18

19 A building emergency plan is implemented for spill prevention,
20 containment, and countermeasures to reduce safety and health hazards to humans
21 and the environment (Chapter 7.0).
22

23
24 **2.6 BUFFER MONITORING ZONE [B-6]**
25

26 The ETF does not store ignitable or reactive waste in tanks. Therefore,
27 the requirements of WAC 173-303-640(9)(b) do not apply to the ETF.
28

29
30 **2.7 SPILLS AND DISCHARGES INTO THE ENVIRONMENT [B-7]**
31

32 Actions to be taken in the event of noncompliance with final status
33 requirements that may endanger human health and the environment, including any
34 incidence of noncompliance resulting from release or discharge of dangerous
35 waste that could threaten human health and the environment outside the ETF,
36 are documented in Chapter 7.0.
37

38
39 **2.7.1 Notification [B-7a]**
40

41 Reporting of any noncompliance with final status requirements that might
42 endanger human health and the environment will be made to Ecology in
43 accordance with the immediate reporting provisions of WAC 173-303-810(14)(f)
44 and includes any information on the following:
45

- 46 • Release of dangerous waste that may cause an endangerment to drinking
47 water supplies or ground or surface waters
48
- 49 • Any information of a release or discharge of dangerous waste, a fire,
50 or an explosion that could threaten the human health and the
51 environment outside the Hanford Facility
52

- Name, address, and telephone number(s) of the owner or operator
- Date, time, and type of incident
- Name and quantity of material(s) involved
- The extent of injuries if any
- An assessment of actual or potential hazards to the environment and human health outside the Hanford Facility, where this is applicable
- The estimated quantity and disposition of recovered material that resulted from the incident.

In addition, an oral report and written submission or written report that contains a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance will be submitted in accordance with the provision of WAC 173-303-810(14)(f).

2.7.2 Mitigation and Control [B7-b)

Releases or discharges of dangerous waste that endanger human health or the environment will be dispositioned in accordance with the applicable provisions of Chapter 7.0 and the applicable provisions of WAC 173-303-600.

2.7.2.1 Cleanup and Management of Released Dangerous Wastes and Contaminated Soil, Water, or Other Materials [B7-b(1) and (2)]. Provisions for dispositioning of recovered material resulting from an incident that endangers human health and the environment will be in accordance with the applicable provisions of Chapter 7.0 and the applicable provisions of WAC 173-303-600.

2.7.2.2 Restoration of Impacted Area [B7-b(3)]. Restoration of property outside the ETF that is impacted by releases or discharges of dangerous waste, a fire, or an explosion will be accomplished in accordance with the applicable provisions of WAC 173-303-600.

2.8 MANIFEST SYSTEM [B-8]

Onsite waste transfers are exempt from the manifest requirements of WAC 173-303-370. However, onsite waste tracking is applied as a matter of good management practice at the Hanford Facility. This section briefly discusses the system that is in place to track waste shipments.

2.8.1 Onsite Waste Shipments

The Hanford Facility has one EPA/State identification number as required by WAC 173-303-060, and all TSD units on the Hanford Facility are part of a single dangerous waste facility. Therefore, onsite shipments of dangerous or mixed waste are not subject to the manifesting requirements specified in WAC 173-303-370 and -180. However, all onsite waste shipments are conducted in a manner to ensure protection of human health and the environment. Four onsite waste tracking systems are voluntarily used for transporting waste on the Hanford Facility. Internal tracking systems document the following four methods of waste transfer:

- Liquid mixed waste via underground pipelines
- Liquid mixed waste via railroad tank car or tank truck or via barrels transported by truck
- Containerized mixed waste (e.g., rags, failed equipment, contaminated soil) via trucks and railroad cars
- Containerized nonradioactive dangerous waste via truck before being shipped offsite for treatment, storage, and/or disposal at a TSD facility.

Specific waste tracking forms for the movement of waste destined for the ETF are used. These waste tracking forms effectively track chemical inventories from procurement through disposal at the ETF. Waste water from the 242-A Evaporator and the LERF treated at the ETF is transferred via pipelines. No incompatible waste is processed by the ETF.

2.8.2 Procedures for Receiving Shipments [B-8a]

The onsite generating unit is responsible for accurately identifying waste composition and arranging for the transport of the waste. A file of the original copy of each transfer data sheet and any other pertinent operating records are maintained by the ETF.

2.8.2.1 Transporter Responsibilities. The 242-A Evaporator operations organization is responsible for transferring waste from the 242-A Evaporator to the LERF and to the ETF. The ETF operations organization is responsible for transferring waste (by pumping) from the LERF to the ETF.

The following are the specific transporter responsibilities:

- Ensuring that the shipments of waste are accompanied by a properly completed data sheet
- Dating and signing the data sheet and obtaining the receiving unit operator's signature
- Maintaining a file of the data sheets

- Ensuring that the entire quantity of waste is delivered to the receiving unit
- Ensuring leak detection.

2.8.2.2 Receiving Unit Responsibilities. The waste tracking methods used are as follows.

- The ETF personnel sign and date the data sheet for waste pumped from the 242-A Evaporator and the LERF, and for waste that falls within the envelope of acceptable waste (Chapter 3.0).
- Significant discrepancies (Section 2.8.3) in the data sheet are noted on each copy of the data sheet. The material balance calculation shown on the data sheet verifies that the volume of dangerous waste covered by the data sheet was received. A discrepancy exists when there is a significant volumetric difference between the amount of waste sent and the amount received that cannot be explained by the volume held within the process equipment.
- The waste transporter retains at least one copy of the signed data sheet.

2.8.3 Response to Significant Discrepancies [B-8b]

The waste tracking methods are as follows for waste transfer discrepancies.

- Discrepancies in the quantity of dangerous waste received are determined using material balances required on the data sheet. A material balance is the difference between the volume of waste taken from the 242-A Evaporator, the LERF, or other waste within an envelope acceptable to the ETF (Chapter 3.0), and the volume of waste introduced to the ETF. The volume of waste sent to the ETF is measured by flowmeters as explained in Chapter 4.0. A significant discrepancy will be a volumetric difference between the amount of waste sent and the amount received that cannot be explained by the volume held within the process equipment or by expansion/contraction explanations.
- Actions taken to deal with significant discrepancies are as follows.
 - Leak detectors, interlocks, and alarms are checked to ensure that the equipment functions properly.
 - Transfer records are checked and examined.
 - Other tanks in the system are checked for an incorrectly routed transfer.

1 **2.8.4 Provisions for Nonacceptance of Shipment [B-8c]**
2

3 Provisions for nonacceptance of shipments are discussed in the following
4 sections.
5

6 **2.8.4.1 Nonacceptance of Undamaged Shipment [B-8c(1)].** If the waste is not
7 suitable for treatment in the ETF, the waste is not transferred to the ETF.
8

9 **2.8.4.2 Activation of Contingency Plan for Damaged Shipment [B-8c(2)].** This
10 section is not applicable. Damaged shipments are not possible in pipeline
11 transfers. The building emergency plan would be activated if some failure of
12 the transfer system were detected (Chapter 7.0).

Figure 2-1. Hanford Site.

1

Figure 2-2. 200 Area Effluent Treatment Facility Layout.

Figure 2-3. Block Flow Diagram.

Figure 2-4. Columbia River Floodplain (probable maximum flood).

T930623

Figure 2-5. Yakima River Floodplain.

1

Figure 2-6. Cold Creek Watershed Floodplain (probable maximum flood).

39203120.10

Figure 2-7. Estimated Traffic Volumes (vehicles per day).

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APPENDIX

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3.0 WASTE CHARACTERISTICS [C]

This chapter provides information on the chemical, biological, and physical characteristics of the waste to be treated and stored at the ETF including waste descriptions, designations, and a waste analysis plan for treatment and storage.

3.1 CHEMICAL, BIOLOGICAL, AND PHYSICAL ANALYSIS [C-1]

This section describes the chemical, biological, and physical characteristics of the waste treated and stored at the ETF. This discussion includes the following:

- A description of the waste types, including an estimate of the chemical and physical composition
- A description of the characteristics of the dangerous waste and a basis for the designation of the waste as dangerous.

Additional information on sampling methods is provided in the ETF waste analysis plan (Appendix 3A).

3.1.1 200 Area Effluent Treatment Facility Treatment and Verification Tank Storage

The ETF treats waste water containing very small concentrations of volatile and nonvolatile substances. Volatile substances consist of organic compounds, ammonia, and radionuclides. Nonvolatile substances consist of organic compounds, inorganic salts, and radionuclides.

Waste acceptance criteria are based on laboratory tests performed on a nonradioactive, surrogate test solution; these tests are referred to as the pilot plant testing. The results of the pilot plant testing were used to develop an operating envelope. The operating envelope defines a waste water feed concentration range that allows for treatment of the waste water to concentrations that will be regulated by the Washington State waste discharge permit (WAC 173-216). The ETF is designed to treat waste within the operating envelope from sources other than the 242-A Evaporator.

The feed material for the pilot plant testing consisted of several surrogate test solutions that were formulated from PC characterization data, Hanford Site chemical inventory, and constituents of regulatory concern. Surrogate test solutions were used because the 242-A Evaporator stopped operation in 1989. The LERF was constructed for the proper storage of the waste water until the ETF was operational. The surrogate solution was tested using scaled-down versions of the treatment systems designed for the ETF, such as UV/OX, RO, and IX.

1 Treated waste water from the ETF is stored in one of three 670,000-gallon
2 (2,536,000-liter) verification tanks until sampling and analysis confirms
3 permit conditions are met. Treated waste water from the ETF process is
4 discharged to the soil column, subject to approval of the Delisting Petition
5 (DOE/RL-92-72) and receipt of the Washington State waste discharge permit
6 (WAC 173-216). Treated waste water not meeting discharge standards is
7 retreated through the ETF until the waste water meets discharge limits, or
8 stored in the verification tanks while other treatment or disposal options are
9 determined. The ability to store dangerous waste in the verification tanks is
10 necessary should the waste water need to be stored longer than 90 days.
11
12

13 3.1.2 Secondary Waste Storage Area

14
15 The ETF primary treatment train process generates a secondary liquid
16 mixed waste. This liquid mixed waste is dried to a powder in the secondary
17 treatment train, accumulated in U.S. Department of Transportation-approved
18 containers, sealed for proper disposal, and stored within the storage area
19 until transferred to a TSD unit. A description of the secondary waste is
20 provided in Chapter 4.0.
21
22

23 3.1.3 Containerized Waste [C-1a]

24
25 The ETF incorporates a secondary containment system as described in
26 Chapter 4.0. Therefore, the requirements of this section are not applicable
27 to the ETF.
28
29

30 3.1.4 Waste in Tank Systems [C-1b]

31
32 A detailed description of the ETF verification tanks and associated
33 processes is provided in Chapter 4.0. Information is summarized in this
34 section to describe the origin of the waste water, the general characteristics
35 of the waste water, and the general characteristics of the treated waste
36 water.
37

38 3.1.4.1 242-A Evaporator Process Condensate. The 242-A Evaporator treats
39 mixed waste stored as alkaline liquids and solids in underground DSTs located
40 within the 200 East and 200 West Areas. Waste stored in the DST System and
41 treated by the 242-A Evaporator includes the following:
42

- 43 • PUREX nonaging waste or low-level waste
- 44
- 45 • Plutonium Finishing Plant low-level processing waste supernate
- 46
- 47 • B Plant process and miscellaneous waste including cell drainage and
- 48 vessel clean out waste
- 49
- 50 • 222-S Laboratory Complex laboratory and decontamination waste
- 51
- 52 • T Plant spent decontamination solutions

- 300 Area laboratory waste
- 300 Area fuels fabrication waste (no longer generated)
- 400 Area laboratory waste
- 100-N dilute phosphate decontamination waste and 100 Area spent fuel storage basin sulfate waste from IX regeneration and sand filter backwashing (no longer generated)
- Single-shell tank salt well pumping waste.

Additional details on the waste streams and the bases for their designation as dangerous waste are presented in the Hanford Facility Dangerous Waste Permit Application, DST System documentation (DOE/RL-90-39). The 242-A Evaporator PC is generated from treatment of waste taken from the DST System.

3.1.4.2 Process Condensate Waste Analysis. As identified in Section 3.1.4.1, different types of waste feed are treated in the 242-A Evaporator. The analytical data represent 34 grab samples taken of the PC between August 1985 and March 1989 at four sampling locations. Ammonia, butyl alcohol, acetone, methyl ethyl ketone (2-butanone), and tetrahydrofuran were detected in over 20 of the 34 samples. The 242-A Evaporator PC stream-specific report (WHC 1990a) discusses the results in detail.

Raw water from the 200 East Area is used in the operation of the 242-A Evaporator and is a contributor to the 242-A Evaporator PC waste stream. The pump seal water and deentrainment components basically are raw water and are integral to the proper operation of the 242-A Evaporator. Comparison of the analytical data for all 34 242-A Evaporator PC samples with respect to raw water samples is presented in the stream-specific report (WHC 1990a). Evaluation of the data indicates 43 analytes (10 inorganic and 33 organic) were detected in the 242-A Evaporator PC that were not detected in the raw water.

3.1.4.3 Waste Characterization. The chemical composition of waste water that can be treated in the ETF is based on the results of pilot plant testing. Characterization of waste water proposed for treatment at the ETF is discussed in the waste analysis plan (Appendix 3A). The sampling and analysis of treated waste water and secondary waste, and the proper management of secondary waste also is discussed in the waste analysis plan (Appendix 3A).

3.1.5 Waste Designation

The ETF mixed waste is designated as toxic and listed mixed waste according to WAC 173-303-070.

1 Waste is designated using the method outlined in WAC 173-303-070. The
2 waste categories considered include the following:

- 3
- 4 • Discarded chemical products
- 5 • Dangerous waste sources
- 6 • Infectious dangerous waste
- 7 • Dangerous waste mixtures
- 8 • Dangerous waste characteristics.
- 9

10 Each of these categories is discussed in the following sections with
11 respect to the waste managed in the ETF verification tanks.

12
13 **3.1.5.1 Discarded Chemical Products.** The first category for waste
14 designation is comparison of the waste constituents to the "Discarded Chemical
15 Products List" (WAC 173-303-9903). No pure chemical products appearing on
16 the "Discarded Chemical Products List" are discarded to the ETF verification
17 tanks. Administrative controls, personnel training, and operating methods
18 ensure that such discharges are prevented. Discarded chemicals that might be
19 managed in the ETF storage area are discussed in Section 3.1.1.

20
21 **3.1.5.2 Dangerous Waste Sources.** The second category for waste designation
22 is comparison of the waste sources to the "Dangerous Waste Sources List"
23 (WAC 173-303-9904). The 242-A Evaporator PC potentially contains listed waste
24 sources with the following listed waste codes:

- 25
- 26 • F001 - Because of the presence of spent halogenated solvent
27 1,1,1-trichloromethane
- 28
- 29 • F002 - Because of the presence of spent halogenated solvent methylene
30 chloride
- 31
- 32 • F003 - Because of the presence of spent nonhalogenated solvents
33 acetone, butyl alcohol, and methyl isobutyl ketone
- 34
- 35 • F004 - Because of the presence of spent nonhalogenated solvent
36 cresylic acid
- 37
- 38 • F005 - Because of the presence of spent nonhalogenated solvent methyl
39 ethyl ketone (2-butanone).
- 40

41 The waste was designated through evaluation of both process information
42 and sampling data. Processes were reviewed and compared with the discarded
43 chemical products list and the dangerous waste source list. The process
44 evaluation included a review of the following information sources:

- 45
- 46 • Material safety data sheets
- 47 • Hanford Site emergency and hazardous chemical inventory report
- 48 • Operating procedures
- 49 • Process chemical inventories
- 50 • Physical inspections where possible.
- 51

1 Sampling data were used as screening tools to enhance and support the
2 results of the process evaluation. This screening was compared with the
3 results of the sampling data against the waste lists contained in
4 WAC 173-303-9903 and WAC 173-303-9904. If a constituent was cited on one or
5 both of these lists, an engineering evaluation was performed to determine if
6 the constituent had entered the waste stream as a discarded chemical product
7 or as a dangerous waste source.
8

9 A procedure was developed for combining anion and cation data to identify
10 possible inorganic compounds (Jungfleisch 1990). The listing of inorganic
11 substances developed by this screening procedure is not intended to be a
12 de facto indication that the substance was discharged to the waste stream,
13 only that the specific cations and anions are present. The right physical
14 conditions must exist for a certain inorganic compound to be present; this
15 screening procedure cannot predict such conditions. The designation is
16 discussed in greater detail in the following sections. A further discussion
17 of the PC designation is provided in Appendix 3B of the *Hanford Facility*
18 *Dangerous Waste Permit Application, 242-A Evaporator Dangerous Waste Permit*
19 *Application* documentation (DOE/RL-90-42).
20

21 3.1.5.2.1 1,1,1-Trichloromethane. 1,1,1-trichloromethane was used for
22 crane decontamination and/or degreasing operations at B Plant and was
23 determined to be a spent halogenated solvent discharged to the DST System.
24 Consequently, the PC is an F001 waste by applying the 'derived-from' rule
25 [WAC 173-303-070(2)(a)].
26

27 3.1.5.2.2 Methylene Chloride. Methylene chloride was used for
28 nonmechanical cleaning operations at T Plant and was determined to be a
29 spent halogenated solvent discharged to the DST System. Consequently, the PC
30 is an F002 waste by applying the 'derived-from' rule [WAC 173-303-070(2)(a)].
31

32 3.1.5.2.3 Acetone. Acetone was used in laboratories to dry glassware
33 and could have been disposed of through drains to the DST System. Acetone was
34 detected in all 34 samples of 242-A Evaporator PC (WHC 1990a). The average
35 concentration of acetone in these samples was 980 parts per billion. Acetone
36 in the form of a discarded chemical product has not been discharged to the
37 DST System. However, acetone as a spent nonhalogenated solvent was determined
38 to be present in the DST System. Consequently, the PC is an F003 waste by
39 applying the 'derived-from' rule [WAC 173-303-070(2)(a)].
40

41 3.1.5.2.4 Butyl Alcohol. Butyl alcohol is an impurity and degradation
42 product from tributyl phosphate used in the PUREX Plant. Butyl alcohol was
43 detected in 30 of the 34 samples at an average concentration of 9,800 parts
44 per billion (9.8 parts per million). It is not known to be a discarded
45 chemical product or a spent solvent.
46

47 3.1.2.5.5 Methyl Isobutyl Ketone. Methyl isobutyl ketone (hexone) was
48 detected in 10 of the 34 samples at an average concentration of 11 parts per
49 billion (WHC 1990a). Between 1951 and 1966, the Reduction-Oxidation Plant
50 used a distillation process to clean hexone for reuse in the solvent
51 extraction process. The hexone was first washed with sodium carbonate to
52 remove the radiation-produced degradation products, and distilled to remove

1 the water that had dissolved in it during washing. The water left behind was
2 combined with the high-level waste stream for final steam stripping in the
3 Reduction-Oxidation Plant waste concentrator. This step recovered any hexone
4 dissolved in the high-level waste stream or in water from the distillation
5 process. After steam stripping, the concentrated high-level waste was sent to
6 boiling waste SSTs in the 241-S and 241-SX Tank Farms.

7
8 The high-level concentrate is considered a secondary waste from the
9 hexone recovery process. The hexone recovery process was used to recover an
10 F003 solvent. Hexone is not known to be a discarded chemical product. The
11 content of the DSTs is a listed waste by applying the mixture rule
12 [40 CFR 261.3(a)(2)(iii)]. Consequently, the PC is an F003 waste by applying
13 the 'derived-from' rule [WAC 173-303-070(2)(a)].

14
15 3.1.5.2.6 Cresylic Acid. A chemical cleaning agent containing cresylic
16 acid (20 percent) was used for various cleaning operations at T Plant and was
17 determined to be a spent nonhalogenated solvent discharged to the DST System.
18 Consequently, the PC is an F004 waste by applying the 'derived-from' rule
19 [WAC 173-303-070(2)(a)].

20
21 3.1.5.2.7 Methyl Ethyl Ketone (2-butanone). Methyl ethyl ketone
22 (2-butanone) was detected in 25 of the 34 samples at an average concentration
23 of 51 parts per billion (WHC 1990a). Methyl ethyl ketone (2-butanone) was
24 used in the Reduction-Oxidation Plant process, and is determined to be a spent
25 nonhalogenated solvent discharged to the DST System. Consequently, the PC is
26 an F005 waste by applying the 'derived-from' rule [WAC 173-303-070(2)(a)].

27
28 3.1.5.2.8 Pyridine. Pyridine was detected in 1 of 34 samples at a
29 concentration of 550 parts per billion (WHC 1990a). Pyridine was not used in
30 Hanford Site chemical reprocessing. Therefore, it is neither a discarded
31 chemical product nor a spent solvent.

32
33 3.1.5.3 Infectious Dangerous Waste. The third category for waste designation
34 is "Infectious Dangerous Wastes" (WAC 173-303-083). Operation of the ETF does
35 not involve the treatment or storage of infectious waste. Therefore, the
36 requirements of WAC 173-303-083 are not applicable to the ETF.

37
38 3.1.5.4 Dangerous Waste Mixtures. The fourth category for waste designation
39 is "Dangerous Waste Mixtures" (WAC 173-303-084). The ETF verification tanks
40 could have constituents that are identified in 40 CFR 302.4 (Spill Table) and
41 in the *Registry of Toxic Effects of Chemical Substances* (NIOSH 1990).
42 Toxicity, persistence, and carcinogenicity are the three criteria considered
43 in dangerous waste mixture designation, as discussed in the following
44 sections. The designation procedures used to analyze concentrations of
45 dangerous waste mixtures were calculated as the upper limit of the one-sided
46 90 percent confidence interval (DOE/RL-90-43).

47
48 3.1.5.4.1 Toxicity. To determine the ETF verification tank waste
49 toxicity, the toxic dangerous waste designation was determined by following
50 the procedure set forth in WAC 173-303-084(5). The procedure calculates the
51 equivalent concentration percentage of the waste stream. As defined in
52 WAC 173-303-9906, a waste stream is a toxic dangerous waste if the calculated

1 equivalent concentration percent sum of all applicable constituents is greater
2 than 0.001 percent. Forty-seven substances associated with toxic categories
3 were identified as potential constituents of the PC. These 47 substances
4 contribute to the calculated equivalent concentration percent sum. Of these
5 substances, ammonia is the largest contributor to the equivalent concentration
6 percent sum (WHC 1990a). The calculated equivalent concentration percent sum
7 of the PC varies between 0.000093 percent and 0.00108 percent. The high end
8 of this range exceeds the designated limit of 0.001 percent, and therefore,
9 the PC is a toxic dangerous waste (WT02).

10
11 3.1.5.4.2 Persistence. The ETF verification tanks do not use, treat,
12 store, or dispose of polycyclic aromatic hydrocarbons. A review of existing
13 processes and analytical data indicated the PC is not a persistent dangerous
14 waste. Therefore, the waste managed at the ETF verification tanks is not
15 designated a persistent dangerous waste mixture.

16
17 3.1.5.4.3 Carcinogenicity. The carcinogenic dangerous waste
18 designation was determined by following the procedure set forth in
19 WAC 173-303-084(7). Three substances potentially present in the PC were
20 determined to be carcinogenic chemical compounds: cadmium chloride, nickel
21 (II) hydroxide, and n-nitrosodimethylamine (WHC 1990a). Because none of the
22 compounds exceeded 0.01 percent, and the sum was less than 1.0 percent of the
23 waste quantity, the waste is not a carcinogenic dangerous waste.

24
25 3.1.5.5 Dangerous Waste Characteristics. The fifth category for waste
26 designation is "Dangerous Waste Characteristics" (WAC 173-303-090).
27 Evaluation of process and analytical data indicated the PC is not designated
28 as a characteristic waste (WHC 1990a). The four characteristics,
29 ignitability, corrosivity, reactivity, and toxicity, are discussed in the
30 following sections.

31
32 3.1.5.5.1 Ignitability. The PC is a dilute aqueous waste. Although
33 flash point testing was not performed, the waste is not expected to be
34 ignitable. Dissolved nitrate is present in the waste but at very low levels.
35 According to the description of ignitable properties in WAC 173-303-090, a
36 waste is ignitable if defined as an oxidizer in accordance with
37 49 CFR 173.151.

38
39 Nitrate is an example oxidizer. However, nitrate is in the waste in such
40 a dilute form (average of 2.8 parts per million), it is not expected to
41 stimulate the combustion of organic matter. The requirement for nitrate to be
42 present in a concentration and form to warrant the ignitable characteristic
43 designation is supported in the *Federal Register* (52 FR 22520).

44
45 The only chemical in an aqueous mixture similar to nitrate that has a
46 concentration limit set for oxidizer classification is nitric acid. In the
47 49 CFR 173.101 "Hazardous Materials Table," nitric acid is given an
48 oxidizer hazard class when the concentration exceeds 40 weight percent
49 (i.e., 400,000 parts per million). Using this limit as a basis, the waste
50 does not exhibit the characteristic of ignitability due to the presence of
51 an oxidizer.
52

1 Furthermore, an ignitability index was calculated for the samples based
2 on the sum of the percent concentrations of all ignitable contributors in the
3 waste. Pure substances with a flash point less than 140 °F (60 °C) were
4 considered ignitable. Samples with an ignitability index below 1 percent were
5 not considered ignitable.

6
7 One or more chemical compounds potentially present in the PC are
8 ignitable substances. The value of the index calculated from these
9 constituents is between 0.000192 percent and 0.00786 percent, well below the
10 1 percent threshold level. Therefore, the PC is not an ignitable waste.

11
12 3.1.5.5.2 Corrosivity. Measurements of pH for the different waste
13 types ranged from 9.72 to 10.83. For PC to be corrosive dangerous waste
14 [WAC 173-303-090(6)], the pH must be less than 2 or greater than 12.5. The PC
15 is, therefore, not a corrosive dangerous waste.

16
17 3.1.5.5.3 Reactivity. For PC to be a reactive dangerous waste
18 [WAC 173-303-090(7)], it must: (1) readily undergo violent chemical change;
19 (2) react violently or form potentially explosive mixtures with water;
20 (3) generate toxic fumes when mixed with water or in the case of cyanide or
21 sulfide-bearing waste, when exposed to mild acidic conditions; (4) explode
22 when subjected to a strong initiating force; (5) explode at normal
23 temperatures and pressures; or (6) fit within the U.S. Department of
24 Transportation forbidden explosives, Class A explosives or Class B explosives
25 definitions. The PC is a dilute aqueous waste stream and clearly does not
26 meet definitions (1), (2), (4), (5), or (6).

27
28 Analysis was performed to determine the cyanide and sulfide
29 concentrations, and whether the PC contains quantities of cyanide or sulfide
30 to generate sufficient toxic gases to threaten human health and the
31 environment. The unofficial threshold levels, as stated in SW-846 (EPA 1986),
32 for hydrogen cyanide gas and hydrogen sulfide gas are 250 milligrams per
33 kilogram and 500 milligrams per kilogram, respectively. From the analytical
34 results, cyanide was not detected in any of the samples. Only one sample
35 showed a total sulfide concentration of 14 milligrams per kilogram, which is
36 equivalent to 14.9 milligrams per kilogram of hydrogen sulfide. Therefore,
37 the PC is not a reactive dangerous waste.

38
39 3.1.5.5.4 Toxicity. The PC is a toxic dangerous waste if contaminant
40 results from toxicity characteristics leaching procedure (TCLP) testing exceed
41 the limits set in WAC 173-303-090(8)(c). In the absence of specific TCLP test
42 results, total analyte concentrations were used. Four analytes with
43 concentrations above detection limits are on the TCLP toxic list and were
44 found in the waste. The PC is not a toxic dangerous waste because none of the
45 total analyte concentrations exceeded the TCLP toxic threshold levels. The
46 levels in leachate derived from the TCLP are not expected to be greater than
47 the total analyte concentrations.

48
49 It should be noted that some DSTs are known or suspected to contain
50 organic TCLP toxics as identified in accordance with EPA "Final Rule Change"
51 (55 FR 11798). It is unknown at this time which DSTs contain these organic
52 TCLP toxic constituents. The waste analysis plan of the Hanford Facility

1 Dangerous Waste Permit Application, DST System documentation (DOE/RL-90-39)
2 outlines the proposed sampling plan and should provide future data to
3 determine which DSTs contain the TCLP toxics.
4
5

6 **3.1.6 Occasional Waste**

7

8 Occasional waste includes mixed and nonradioactive dangerous waste such
9 as rags, paper towels, disposable pipettes, contaminated gloves, and other
10 miscellaneous materials associated with the performance of the ETF processes.
11 This type of waste is collected separately, segregated from nondangerous dry
12 waste, and stored in the storage area until transferred to a TSD unit. The
13 nonradioactive dangerous waste generated during ETF operations also is stored
14 in the ETF storage area until transferred to the 616 Nonradioactive Dangerous
15 Waste Storage Facility.
16
17

18 **3.1.7 Waste in Piles [C-1c]**

19

20 Operation of the ETF does not involve the placement of dangerous waste in
21 piles. Therefore, the requirements of WAC 173-303-660 are not applicable to
22 the ETF.
23
24

25 **3.1.8 Landfilled Waste [C-1d]**

26

27 Operation of the ETF does not involve the placement of dangerous waste in
28 landfills. Therefore, the requirements of WAC 173-303-665 are not applicable
29 to the ETF.
30
31

32 **3.1.9 Waste Incinerated and Waste Used in Performance Tests [C-1e]**

33

34 Operation of the ETF does not involve the incineration of dangerous
35 waste. Therefore, the requirements of WAC 173-303-670 are not applicable to
36 the ETF.
37
38

39 **3.1.10 Waste to be Land Treated [C-1f]**

40

41 Operation of the ETF does not involve the land treatment of dangerous
42 waste. Therefore, the requirements of WAC 173-303-655 are not applicable to
43 the ETF.
44
45

46 **3.1.11 Envelope of Waste Characteristics Allowed as Feed to the** 47 **200 Area Effluent Treatment Facility**

48

49 The operating envelope defines the range of constituents and
50 concentrations in a waste water that can be treated by the ETF. This
51 operating envelope was developed through pilot plant tests using a surrogate
52 test solution. Although the operating envelope design was directed at

1 treating 242-A Evaporator process condensate, the list of constituents
2 composing the surrogate test solution was expanded to include constituents
3 that represent additional chemical groups that could be treated at the ETF.
4 The surrogate test solution constituents were based on the 242-A Evaporator PC
5 characterization data, a Hanford Site chemical inventory, and constituents of
6 regulatory concern. The additional constituents were tested to demonstrate
7 the flexibility of the ETF in treating a variety of contaminants.

8
9 The operating envelope for the organic constituents was developed using
10 the destruction efficiency determined from UV/OX pilot plant test data. The
11 organic constituent destruction efficiency was measured by determining the
12 oxidation rate (the rate at which an organic constituents was destroyed). The
13 operating envelope for the inorganic constituents was developed using removal
14 efficiencies determined from RO and IX pilot plant test data. The removal
15 efficiency for each inorganic constituent from each surrogate test solution
16 test was determined by comparing the constituent concentration in the RO feed
17 to the constituent concentration in the IX discharge. In the ETF, a
18 verification sampling program following the treatment process monitors the
19 efficiency of the treatment process, as well as verifies that the treated
20 effluent meets regulatory criteria before disposal.

21 22 23 3.1.12 Delisting of Treated Waste Water

24
25 The testing described in Section 3.1.11 is used to support a delisting
26 petition currently before the EPA (DOE/RL-92-72). When granted, the delisting
27 petition will affirm that the ETF treatment processes are robust enough to
28 ensure removal or destruction of contaminants to delisting criteria levels.
29 This means that the treated waste water from the ETF no longer requires
30 management as a dangerous waste.

31 32 33 3.2 WASTE ANALYSIS PLAN [C-2]

34
35 The waste analysis plan (Appendix 3A) discusses the sampling and analysis
36 of waste treated and generated at the ETF. Waste generated at the ETF
37 includes the treated waste water, powdered solids from the ETF dryer, spent IX
38 resins, spent offgas filters, expended or fouled equipment (e.g., spent RO
39 membrane cartridges and used UV lamps), and miscellaneous radioactive and
40 nonradioactive maintenance waste. Only the treated waste water, powdered
41 solids, and spent IX resins are sampled routinely and analyzed. The ETF does
42 not store ignitable, reactive, or incompatible waste. Therefore, it is not
43 necessary for this waste analysis plan to address waste-to-waste
44 compatibility. With regard to routine sampling and analysis, details are
45 provided in this section for the following:

- 46
- 47 • Parameters and rationale
- 48 • Test methods
- 49 • Sampling methods
- 50 • Frequency of analysis.
- 51
- 52

1 3.2.1 Parameters and Rationale [C-2a]
2

3 The parameters and rationale were selected to characterize the waste
4 based on historical waste analyses of the 242-A Evaporator PC and associated
5 process knowledge. These same parameters were used in part to develop the
6 operating envelope. The analytical parameters, along with the approved
7 methods of analysis and the rationale for selection, are presented in the
8 waste analysis plan (Appendix 3A).
9

10
11 3.2.2 Test Methods [C-2b]
12

13 Approved analytical test methods are based on WAC 173-303-110 and are
14 described in the waste analysis plan (Appendix 3A).
15

16
17 3.2.3 Sampling Methods [C-2c]
18

19 Sampling methods are as follows.
20

- 21 • A flow proportional sampler is used to sample treated waste water
22 before filling one of the three verification tanks [675,000 gallons
23 (2,551,500 liters) each]. When the first tank is full, a second tank
24 receives the treated waste water. When the second tank is full, a
25 third tank receives the treated waste water. Hence, typical
26 operations have one tank in the fill mode, one tank in the standby
27 mode while sample analyses are being run, and a third tank in the
28 discharge mode. Required volumes, preservation techniques, and
29 holding times of the different analytical methods are detailed in the
30 waste analysis plan (Appendix 3A). Chain-of-custody procedures are
31 followed.
32
- 33 • A sampler is used to sample liquid feed to the ETF dryer at the
34 location of the two concentrate tanks.
35
- 36 • The spent IX resin sample is taken from each container of waste.
37
- 38 • Non-PC alternative feeds to the ETF are sampled.
39

40
41 3.2.4 Frequency of Analysis [C-2d]
42

43 The ETF waste analysis plan (Appendix 3A) establishes the frequency of
44 analysis.
45

46
47 3.2.5 Liquid Effluent Discharge Limits
48

49 Discharge limits are set in the *State Waste Discharge Permit Program*
50 (WAC 173-216).

1 3.2.6 Quality Assurance Program

2
3 A laboratory quality assurance plan identifies the quality assurance
4 practices and requirements associated with the activities of the laboratory
5 and meets the requirements of *Interim Guidelines and Specifications for*
6 *Preparing Quality Assurance Project Plans* (EPA 1983), NQA-1 (ANSI/ASME 1986),
7 and ASTM C-1009-83 (ASTM 1983). Similarly, an ETF quality assurance plan
8 identifies the quality assurance practices and requirements associated with
9 the activities of the ETF. These plans are available at the Hanford Facility
10 for inspection by regulatory personnel.
11

12
13 3.3 ADDITIONAL REQUIREMENTS FOR WASTE GENERATED OFFSITE [C-2e]

14
15 If a decision is made to treat or store dangerous and mixed waste
16 generated offsite, a permit modification will be sought.
17

18
19 3.4 ADDITIONAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR
20 INCOMPATIBLE WASTE [C-2f]

21
22 Ignitable, reactive, or incompatible waste is not treated or stored in
23 the ETF. Section 3.1.5.5 discusses the dangerous characteristics of the PC.
24 Therefore, requirements imposed on ignitable, reactive, or incompatible waste
25 are not applicable to the ETF.
26

27
28 3.5 LAND DISPOSAL RESTRICTIONS

29
30 Treated waste water from the ETF will be a delisted waste (by EPA
31 approval of the delisting petition), and will not be subject to LDR. However,
32 any waste that contacts untreated waste will be listed waste. Although the
33 Tri-Party Agreement grants the U.S. Department of Energy a variance in the LDR
34 requirements, the appropriate constituents subject to the requirements are
35 tracked.

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4.0 PROCESS INFORMATION [D]

This chapter provides a detailed discussion of the ETF processes and equipment.

The ETF receives waste water from the 242-A Evaporator, the LERF, and potentially may receive waste water from other sources in the 100, 200, 300, and 400 Areas of the Hanford Facility. The waste water is treated in a series of process units, or systems, extracting or destroying essentially all of the dangerous waste and radioactive constituents except tritium. Before discharge, the quality of the treated waste water is analyzed to verify that the discharge limits have been met. The treated waste water is piped to a SALDS north of the 200 West Area, where the treated waste water is discharged to the ground under the authority of a Washington State waste discharge permit and an approved hazardous waste delisting petition.

4.1 PROCESS DESCRIPTION

The ETF contains several tanks and process unit systems for the treatment of dilute waste water generated on the Hanford Facility. Figure 4-1 provides an overview of the layout of the ETF Building, Figure 4-2 shows the ETF floor plan, and Figure 4-3 is the ETF process flow diagram.

Waste water to the ETF from the 242-A Evaporator and the LERF is piped to the surge tank. The waste water passes from the surge tank into the primary treatment train where the organic, inorganic, and radioactive constituents are removed from the waste water. Waste generated during the primary process passes into the secondary treatment train where the waste is processed and prepared for final transfer to a TSD unit. The primary and secondary treatment trains are described in the following sections.

4.1.1 Primary Treatment Train

The primary treatment train receives waste water in the surge tank, processes the waste water, and discharges the treated waste water to the soil column. The primary treatment train consists of the following systems:

- Surge tank (pH adjustment)
- Coarse filtration
- UV/OX system
- pH adjustment
- Hydrogen peroxide decomposer
- Fine filtration
- Degasification
- RO system
- Polisher (IX columns)
- pH adjustment
- Verification tanks
- Cooling tower.

1 4.1.1.1 Surge Tank. The waste water enters the ETF at the surge tank,
2 located outside the ETF Building on the south side. The surge tank also
3 receives waste extracted by various systems within the primary treatment
4 train, such as sumps, regeneration rinsing water from the polisher, and the
5 distillate from the ETF evaporator and the thin film dryer.
6

7 The surge tank is insulated and the contents heated to prevent freezing.
8 The pH of the contents is adjusted to about 6.0 by the metered addition of
9 92-weight percent sulfuric acid (H_2SO_4) or 50-weight percent sodium hydroxide
10 (NaOH). The main purpose of pH control in the surge tank is to change free
11 ammonia into ammonium ion to prevent ammonia from being discharged into the
12 vessel ventilation system. This pH range also corresponds to the operation
13 range for the UV/OX system. A titration analyzer is used to adjust and
14 maintain the pH.
15

16 One of the three surge tank pumps circulates the contents, mixing the
17 sulfuric acid or the sodium hydroxide and the waste water to a uniform pH.
18 A second pump forces the pH adjusted waste water through the rough filter.
19 The remaining pump serves as a spare.
20

21 4.1.1.2 Coarse Filtration. The 2-micron rough filter removes the larger
22 particulates from the waste water. The solids accumulating on the filter
23 element are backwashed to the secondary waste receiving tanks with pulses of
24 compressed air, forcing water back through the filter. The backwash operation
25 is started automatically by a rise in differential pressure across the filter.
26 The backwash operation is accomplished in 5 minutes, at an expected frequency
27 of less than once a week. The filter medium is expected to operate for at
28 least 1 year between replacements. The filtered waste water then passes
29 through a plate cooler, to reduce the temperature to less than 100 °F (38 °C),
30 before entering the UV/OX chambers.
31

32 4.1.1.3 Ultraviolet Oxidation System. The purpose of the UV/OX system is to
33 break down the organic compounds in the waste water, producing carbon dioxide,
34 water, and inorganic ions. The UV/OX system uses the photochemical reaction
35 of UV light on hydrogen peroxide to decompose the organic constituents.
36

37 Hydrogen peroxide is mixed with the waste water, and then exposed to
38 UV light. The photochemical reaction of UV light and hydrogen peroxide causes
39 the formation of hydroxyl radicals and other reactive species that cause the
40 decomposition of organics.
41

42 Organic destruction is accomplished in two UV/OX units operating in
43 series. During the UV/OX process, the waste water passes through mixing and
44 dosing chambers within reaction chambers where hydrogen peroxide is added.
45

46 In each reaction chamber, a high-intensity UV lamp is covered by a quartz
47 tube with a tube-cleaning device. Cleaning of the quartz tube exteriors and
48 reaction chamber interiors is performed automatically by rubber rings that
49 slide across the surface of the quartz tubes. This cleaning process occurs in
50 a stand-by mode as necessary without process shutdown.
51

1 The UV/OX system is equipped with automatic shutdown should the following
2 circumstances occur: overpressurization, moisture in lamp end enclosure, high
3 temperature, low water, failure of the hydrogen peroxide storage/feed module,
4 high lamp drive enclosure temperature, and open access door. Also provided is
5 a level sensor to protect the UV lamps against the risk of exposure to air.
6 Should the liquid levels fall low enough to expose the lamps to air, the
7 UV lamps are shut down automatically. After shutdown, the UV lamps cannot be
8 restarted until the lamp temperature decreases to a specified level. The
9 waste water is received next in the pH adjustment tank.

10
11 4.1.1.4 pH Adjustment. The pH adjustment chemically alters the ammonia and
12 carbonate ions in the waste water. The waste water pH is adjusted with a
13 solution of 4-weight percent sulfuric acid or 4-weight percent sodium
14 hydroxide to a pH of approximately 4.0. In this acidic solution, ammonia is
15 converted to an ammonium ion specie that is removed downstream by the
16 RO system. Acidification also changes the chemistry of the carbonate ion,
17 causing it to form carbon dioxide, a gas with low solubility that can be
18 removed from the waste water.

19
20 The pH adjustment tank has two pumps, one of which operates as a spare.
21 A constant liquid level is maintained in the tank to facilitate an even and
22 constant pH of the waste water. The waste water is pumped through the
23 hydrogen peroxide decomposer.

24
25 4.1.1.5 Hydrogen Peroxide Decomposer. The purpose of the hydrogen peroxide
26 decomposer is to reduce the amount of hydrogen peroxide left in the waste
27 water from the UV/OX system. The hydrogen peroxide injected for the UV/OX
28 system is not completely consumed in the process of organic destruction,
29 leaving approximately 100 to 200 parts per million in the waste water.
30 A strong oxidant, hydrogen peroxide could harm the membranes in the RO system.
31 Therefore, the waste water is sent through a simple packed column that breaks
32 down the hydrogen peroxide into water and oxygen.

33
34 The residual hydrogen peroxide is decomposed by flowing through one of
35 two vessels containing packed beds of catalyst. A safety relief valve on each
36 vessel opens to relieve excessive system pressure to sump tank No. 2. The
37 break down of hydrogen peroxide forms water and oxygen as the waste water
38 flows through the catalyst bed. The gas generated by the decomposition of the
39 hydrogen peroxide accumulates at the top of the hydrogen peroxide decomposer
40 column where it is diluted with piped-in air. Diluting the oxygen protects
41 the piping and equipment from oxidation. The mixed gas is then discharged to
42 the sump tank, which is vented to the vessel offgas system. The waste water
43 discharge flows from the decomposer to the fine filter.

44
45 4.1.1.6 Fine Filtration. The fine filter removes suspended solids larger
46 than approximately 0.5 micron. The filter is designed to operate at up to
47 150 pounds per square inch gauge.

48
49 Differential pressure between the inlet and outlet of the fine filter is
50 monitored. When the differential pressure reaches a predetermined value, the
51 filter goes into the backwash operation automatically. Solids accumulating on
52

1 the filter element are backwashed to the secondary waste receiving tank with
2 pulses of compressed air that force water back through the filter. The
3 backwashing operation is expected to last 5 minutes and to occur less than
4 once a week. The filter is expected to operate for at least 1 year before
5 replacement. The waste water discharged through the filter then undergoes
6 degasification.

7
8 **4.1.1.7 Degasification.** The function of the degasification column is to
9 remove the carbon dioxide formed when the waste water was acidified in the pH
10 adjustment tank. Carbonate ions are removed to prevent increasing the
11 contaminant loading to the RO system and other downstream ETF processes (i.e.,
12 IX, evaporation, and drying).

13
14 A plate-type heat exchanger is provided for cooling the waste water fed
15 to the degasification column. The carbon dioxide-laden waste water passes
16 down through a packed bed at a slight vacuum [approximately 2 inches of water
17 (0.051 kilogram per square centimeter)] with air blowing up through the packed
18 bed. Because of the low solubility of the carbon dioxide, contact with the
19 countercurrent air purges the waste water of the carbon dioxide molecules.
20 Offgas from the degasification column is discharged by the degasification
21 blower to the vessel offgas system.

22
23 Extremely low pressure developed by the column blower that could
24 compromise column integrity is relieved by a pressure relief safety valve.
25 The column liquid level is controlled automatically. The degasified waste
26 water is fed to the first stage RO feed tank by the degasification pump.

27
28 **4.1.1.8 Reverse Osmosis System.** The function of the RO system is to reduce
29 the concentration of dissolved solids, radionuclides, and any remaining large
30 molecular weight organic materials in the waste water.

31
32 Reverse osmosis is a process that uses pressure to force clean water
33 molecules through special membranes while keeping the larger molecule
34 contaminants within the membranes. The waste water passes through two or more
35 of the pressure vessels containing the RO membranes before going to the next
36 system.

37
38 The membranes are of a composite polyamide type that are nearly
39 impermeable to ammonium ions. Contaminants, including the ammonium, are
40 removed from the waste water as the fluid moves through the membranes. The
41 cleaned waste water discharged from the system is referred to as the permeate,
42 while the contaminated waste is called the reject stream, concentrate,
43 retentate, or brine.

44
45 The RO system enhances contaminant removal by using two stages (instead
46 of one) and by a crossflow pattern through the membrane modules. The
47 concentrate from the first stage RO membranes is collected in the secondary
48 waste receiving tanks, and the permeate (the waste water that has passed
49 through the membranes) is routed to the second stage RO for additional
50 treatment before being discharged to the polisher. Concentrate from the
51 second stage RO is routed back to the first stage RO feed tank. Note that the

1 complete RO system is designed with 50 percent excess capacity (i.e., one
2 third of the system is always in a cleaning or standby mode, while the other
3 two-thirds are in operation).

4
5 4.1.1.9 Polisher. The polisher is for final removal of residual dissolved
6 solids from the waste water.

7
8 The permeate discharge from the second RO stage is pumped to the
9 polisher, which consists of three IX columns, each with mixed beds of cation
10 and anion resin. Two of the columns operate while the third is regenerated,
11 or cleaned. The IX columns operate in series, meaning waste water flows down
12 through one IX column and then down through the second.

13
14 When the capacity of the resin in the first of the two online columns is
15 exceeded, as detected by an increase in the conductivity of the IX column
16 discharge, the column is removed from service for regeneration. The third
17 unit, which was offline, is placed in service (to become the second of two
18 online columns).

19
20 The column removed from service is prepared for regeneration by
21 separating the resins into a layer of anion resin and a layer of cation resin.
22 The resins are separated by an upflow of clean water from the verification
23 tank, which floats the lighter anion resin to the top of the resin bed. The
24 contaminants in the cation resin are eluted with dilute (4 weight percent)
25 sulfuric acid and the anion resin with dilute (4 weight percent) sodium
26 hydroxide. The resulting concentrated (salt-loaded) regeneration waste
27 streams are collected in the secondary waste receiving tanks. Thereafter, a
28 dilute rinsing of both the anion and cation resins occurs, producing a
29 solution (rinse waste) that is collected in the surge tank. Compressed air is
30 used to remix the cation and anion bed after regeneration is complete.

31
32 Eventually, the IX resins become exhausted so that further regeneration
33 is inefficient. When that happens, the spent resins are slurried, or washed,
34 with water from the IX vessels into a disposal container. The container is
35 sealed with a special lid that allows the following: spent resin to go in the
36 containers, resin dewatering and water removal, and television monitoring of
37 the resin and water levels within the container. Slurried resin enters the
38 container through the lid to displace air that is removed by a blower. The
39 air flows through an entrainment separator to remove water drops and then
40 flows through a high-efficiency particulate air (HEPA) filter into the vessel
41 ventilation system. Liquid is pumped from the container and sent to the surge
42 tank as required to remove water from the resin.

43
44 The IX vessels are equipped with visual inspection ports that allow
45 observation during resin separation, bed expansion, and operation. Each
46 vessel outlet is monitored for conductivity and pH to prevent overloading of
47 the resin beds between regeneration cycles. Automatically operated valves
48 recycle poor quality effluent back to the surge tank, if needed, to prevent
49 contamination of the verification tanks. Resin traps and a resin strainer
50 prevent resin loss into the verification tanks. The waste water discharged
51 from the polisher system is piped to the effluent pH adjustment tank.
52

1 4.1.1.10 pH Adjustment. This final pH adjustment tank neutralizes the waste
2 water for discharge. A small flow of dilute sulfuric acid or dilute sodium
3 hydroxide is used to adjust the pH to between 6.5 and 8.5. An eductor in the
4 tank ensures adequate mixing of the added chemicals. The pH of the waste
5 water is monitored and controlled continuously.
6

7 The liquid level in the effluent pH adjustment tank is kept at a constant
8 level to facilitate the pH adjustment process. A signal from the tank liquid
9 level sensor transmitted to the flow control valve on the tank outlet adjusts
10 the level in the tank by causing a corresponding increase or decrease in the
11 flow to the verification tanks. Should an overflow occur, the waste water is
12 collected in sump tank No. 2.
13

14 4.1.1.11 Verification Tanks. Three verification tanks, constructed of carbon
15 steel and lined with epoxy, hold the treated waste water while a laboratory
16 analysis is performed to determine if treatment is complete. The verification
17 sample is taken by a flow proportional sampler as the treated waste water is
18 pumped from the effluent pH adjustment tank to the verification tanks
19 (Figure 4-1). The treated waste water can be pumped back into the treatment
20 train if the water does not meet the Washington State waste discharge permit
21 limits.
22

23 The three verification tanks alternate between three operating modes:
24 receiving treated waste water, holding treated waste water during laboratory
25 analysis and verification, or discharging verified waste water.
26

27 All of the verification tanks have a liquid level sensor, a liquid level
28 indicator, and a high-level alarm. The verification tank system includes
29 three pumps: one delivers treated waste water to the SALDS, one pump
30 circulates the treated waste water through tank eductors and serves as a water
31 supply to various processes within the ETF, and one pump is a spare on
32 standby.
33

34 4.1.1.12 Cooling Tower. The UV/OX and RO systems have upper temperature
35 limitations for the waste water being treated. Heat exchangers and a cooling
36 tower are used to control the temperature of the waste water.
37
38

39 4.1.2 Secondary Treatment Train

40

41 The following waste, generated by the primary treatment train systems, is
42 processed in the secondary treatment train:
43

- 44 • Concentrate from the first RO stage
- 45 • Backwash from the rough and fine filters
- 46 • Regeneration waste from the polisher.
47

1 The secondary treatment train collects, concentrates, dries, and packages
2 the waste in 55-gallon (208-liter) lined steel containers. The secondary
3 treatment train consists of the following:

- 4
- 5 • Secondary waste receiving tanks
- 6 • ETF evaporator
- 7 • Concentrate receiving tanks
- 8 • Thin film dryer
- 9 • Container handling system.

10
11 **4.1.2.1 Secondary Waste Receiving Tanks.** Secondary waste is collected in two
12 secondary waste receiving tanks. The tanks alternate between receiving the
13 secondary waste generated, and serving as a feed tank for the ETF evaporator
14 feed tank. The rising liquid in the tank activates a high-level switch that
15 diverts the flow to the other tank. Each secondary waste receiving tank has a
16 pump on the tank outlet that can be used to circulate the tank contents or to
17 supply feed to the ETF evaporator. A high-level alarm indicates an abnormal
18 situation. Secondary containment for these tanks routes liquids to sump
19 tank No. 1.

20
21 Chemical pH adjustment of the tank contents is accomplished by the
22 controlled addition of dilute sulfuric acid or dilute sodium hydroxide. The
23 pH is adjusted to approximately 6.0 to optimize conditions in the ETF
24 evaporator and thin film dryer equipment and to minimize any ammonia
25 generation.

26
27 **4.1.2.2 200 Area Effluent Treatment Facility Evaporator.** The purpose of the
28 ETF evaporator is to reduce the volume of waste before drying.

29
30 Feed from the secondary waste receiving tank is pumped through a
31 preheater (feed/distillate exchanger) to a forced circulation evaporator loop.
32 In the evaporator loop, concentrate is produced as the water is driven off
33 overhead.

34
35 Water vapor in the overheads from the ETF evaporator passes through an
36 entrainment separator, which removes entrained water droplets and solid
37 particulates, returning them to the evaporator loop. The cleaned vapor is
38 condensed and fed to the distillate flush tank. Some condensate from this
39 tank is sprayed into the entrainment separator to scrub out particulates.
40 Finally, the condensate is cycled back to the surge tank for further
41 processing.

42
43 **4.1.2.3 Concentrate Receiving Tanks.** The ETF evaporator concentrate is
44 pumped to the two concentrate tanks. These concentrate tanks function
45 alternately between concentrate receiver and feed tank for the thin film
46 dryer. The rising liquid level in the tank receiving concentrate actuates a
47 high-level switch that diverts the flow to the other concentrate tank.
48 Secondary containment for these tanks routes liquids to sump tank No. 1.

49
50 Both concentrate tanks have a circulation pump on the tank outlet that
51 can be used to circulate the tank contents or to supply feed to the thin film
52 dryer via the concentrate feed pump. Dilute sulfuric acid and dilute sodium

1 hydroxide can be added to the tanks for pH adjustment. Homogenization by an
2 eductor and pH adjustment (if necessary) is completed before the tank is
3 filled and enters the feed mode. The concentrate tank circulation pump feeds
4 the concentrate feed pump, which in turn supplies the thin film dryer.
5

6 A sample from the recirculation line is taken to characterize the tank
7 contents; characterization of the liquid is representative of the powder
8 produced by the dryer. (Application of ALARA principles showed this method of
9 characterization to be preferred, as opposed to sampling powder.) This
10 provides complete characterization of the container contents and minimizes
11 exposure to workers.
12

13 The temperature of the concentrate is increased by a steam preheater to
14 enhance the operation of the thin film dryer.
15

16 **4.1.2.4 Thin Film Dryer.** The purpose of the thin film dryer is to dry the
17 concentrated secondary waste into a powder. Concentrate is distributed on the
18 inner cylinder of the thin film dryer by wiper blades that rotate on a shaft
19 centered in the cylinder (Figure 4-5). The shaft is driven by an electric
20 motor. The concentrate is dried by steam heat introduced into a annular space
21 (steam jacket) between the outer shell and the inner cylinder. Steam heat
22 transferred across the inner cylinder wall heats the concentrate as it flows
23 down the inside surface. Heating is controlled by regulating the steam
24 pressure to the steam jacket. Condensate from the steam is returned to a
25 steam boiler dedicated to the dryer. A safety valve on the thin film dryer
26 steam and vapor lines vent independently to sump tank No. 1.
27

28 Overhead vapor released by the drying of the concentrate is condensed in
29 a spray condenser. The condensed vapor forms a distillate by direct contact
30 within a spray condenser. The distillate flow is circulated by a dryer
31 distillate pump. Excess heat is removed from the distillate by a water-cooled
32 heat exchanger. Part of the distillate is circulated back to the condenser
33 spray nozzles. The remaining distillate is pumped to the surge tank. Any
34 noncondensable vapors and particulates from the spray condenser are exhausted
35 by a vacuum blower to the vessel ventilation system.
36

37 The concentrate dries to a film as it flows down the length of the dryer.
38 The dried film, or powder, is scraped off the dryer cylinder by blades
39 attached to the rotating shaft. The powder is funnelled through a cone-shaped
40 powder hopper at the bottom of the dryer and into a rotary valve that feeds
41 the powder into a container. An air-driven vibrator mounted on the cone
42 section assists powder movement out of the thin film dryer into a 55-gallon
43 (208-liter) container.
44

45 **4.1.2.5 Container Handling System.** Empty containers with liners and lids are
46 removed from empty-container storage and placed on a conveyor. The containers
47 are moved into the container filling area after passing through an air lock.
48 An empty container located under the powder port of the thin film dryer is
49 raised into position by an elevator. The container is sealed to the thin film
50 dryer and the rotary valve begins the transfer of powder out of the thin film

1 dryer into the empty container. Air displaced from the container is vented to
2 the extrainment separator attached to the ETF evaporator that exhausts to the
3 vessel ventilation system.
4

5 The container is filled to a predetermined weight, then moved along the
6 conveyor to the smear station airlock. At the smear station airlock, the
7 container is moved onto the discharge conveyor by remote control. The airlock
8 is opened and the smear sample (surface wipe) is taken and the radionuclide
9 contamination level is counted. If the container has contaminated material on
10 the outside, the container is moved to the washdown station where the
11 container is washed with treated water from the verification tanks. The
12 container wash water drains to sump tank No. 1. The washed container is
13 air-dried and retested. Filled containers that pass the smear test are
14 labeled, placed on pallets, and moved by forklift to the filled storage area.
15 Section 4.2 provides a more detailed discussion of container handling.
16
17

18 4.2 CONTAINERS [D-1] 19

20 A container handling and filling system and a separate filled container
21 storage area are located along the east wall of the ETF building. Powdered
22 waste, consisting primarily of ammonium sulfate and/or other salts, is loaded
23 from the powder hopper beneath the thin film dryer into 55-gallon (208-liter)
24 lined containers.
25

26 The operating sequence begins with loading empty steel containers onto
27 the empty conveyor. The conveyor takes a container through an airlock and
28 positions the container under the dryer powder hopper. The container is
29 filled to a predetermined weight, conveyed to the capping station, and another
30 empty container is positioned under the dryer powder hopper.
31

32 At the capping station, a lid is positioned and affixed. The closed
33 container is moved to the filled container conveyor area. The container is
34 moved onto the discharge conveyor, at the smear station airlock, via controls
35 on the local control panel. The airlock is opened and the smear sample
36 (surface wipe) is taken and the radioactive contamination level is counted.
37 Radioactive contamination is used as an indicator that the waste has
38 contaminated the exterior surface of the container. If the smear is below
39 limits, the container is labeled and moved to the filled container storage
40 area. If the container fails the smear test, the container is conveyed to the
41 washdown station, washed, and returned to the smear station and tested again.
42

43 Containers are moved into the filled container storage area by forklift.
44 Approximately 720 containers can be stored in the storage area. The
45 containers are stored on pallets, stacked three high, providing 30 inches
46 (76.2 centimeters) of aisle space on both sides of each pallet. Secondary
47 containment in both the filled container storage area and the container
48 handling room consists of a 6-inch- (15.24-centimeter-) thick concrete floor,
49 sealed joints, waterstops between the floor and curbs, 6-inch-
50 (15.24-centimeter-) high curbs, and chemical-resistant sealant applied to all
51 concrete containment surfaces.
52

1 Additional dangerous waste, processing equipment, or media generated at
2 the ETF includes spent resin from the polishers, spent RO membranes, spent
3 HEPA cartridges, spent filter elements, and UV lamps. This waste, except for
4 the UV lamps, is considered mixed waste because of possible radioactive
5 contamination and because these materials might have been in contact with
6 listed waste. These waste materials, except for spent resin, are contained in
7 new 30-, 55-, or 85-gallon (113-, 208-, or 322-liter) steel containers and
8 stored in the filled container storage area until shipped for long-term
9 storage or disposal.

10
11 In the following sections, characteristics of the container storage area
12 and container management practices are described.

13 14 15 **4.2.1 Containers With Free Liquids [D-1a]**

16
17 Most regulated waste generated at the ETF is dry; however, some
18 containerized waste might contain free liquids, e.g., dewatered spent resin.
19 The filled-container storage area is designed to meet requirements for storage
20 of free liquids in containers (Section 4.3.8).

21 22 23 **4.2.2 Containers Without Free Liquids [D-1b]**

24
25 The majority of waste generated and stored at the ETF is the solid waste
26 from the secondary treatment train. This material is a powder, consisting of
27 inorganic constituents such as ammonium sulfate and sodium sulfate with less
28 prevalent constituents including nitrate/nitrite, sodium, silicon, carbonate,
29 potassium, calcium, fluorine, and chlorine, with trace amounts of radioactive
30 elements. Organic constituents are removed during the treatment process.

31
32 Small quantities of other miscellaneous waste generated indirectly from
33 the processing of the waste water stream are stored as needed in the filled
34 container storage area. This waste includes spent resin from the polishers,
35 spent RO membranes, spent HEPA cartridges, spent filter elements, and UV
36 lamps. None of this waste contains free liquids.

37
38 **4.2.2.1 Tests for Free Liquids [D-1b(1)].** Waste stored in the filled
39 container storage area is a dry powder; however, the filled-container storage
40 area is designed to meet requirements for storage of free liquids in
41 containers (Section 4.3.8). Tests for free liquids are performed before
42 transfer for long-term storage or disposal.

43
44 **4.2.2.2 Description of Containers [D-1b(2)].** The containers used to collect
45 the powdered waste material from the thin film dryer are new U.S. Department
46 of Transportation 7A Type A Specification 17C galvanized 55-gallon (208-liter)
47 steel containers (WHC 1992, p. 5-3). Only new containers are used to collect
48 this waste material; no reused or reconditioned containers are used. The
49 miscellaneous waste mentioned previously also is placed in galvanized steel
50 containers, U.S. Department of Transportation 7A Type A Specification 17C, of
51 30-, 55-, or 85-gallon (114-, 208-, 322-liter) capacity. The one exception to
52 this type of container is the container used for storage of spent resin.

1 Each container is handled, packaged, and shipped in accordance with
2 onsite procedures (WHC 1988).
3

4 A filled and closed container of powdered waste that has passed the smear
5 test is labeled before transport to the filled container storage area.
6 A hazardous waste label with the appropriate waste code(s) is affixed to the
7 container (WHC 1988). Therefore, routine removal of old labels will not be
8 performed. However, if a label is damaged or new information needs to be
9 added, the old label will be completely removed and a new label will be
10 affixed to the container.
11

12 4.2.2.3 Container Management Practices [D-1b(3)]. Empty containers, four to
13 a pallet, are moved from storage to the empty container conveyor area using a
14 forklift. The forklift raises the pallet to the height of the conveyor and
15 the containers are loaded manually onto the conveyor. Usually 8, but no more
16 than 12 containers are loaded in this manner each day, so that the empty
17 containers are ready to be moved through the airlock on the conveyor. The
18 empty pallets are stacked next to the exit airlock where filled containers
19 leave the dryer hopper.
20

21 Containers are filled via a remotely controlled system that is
22 synchronized with the dryer operating sequence. The container handling room
23 is illustrated in Figure 4-4. The empty airlock front door opens and the
24 empty conveyor moves one container into the airlock compartment. The empty
25 airlock conveyor receives the container and centers the container within the
26 airlock. The front airlock door closes. The rear door of the empty airlock
27 opens and the empty airlock conveyor moves the container to the container
28 filling conveyor, which moves the container to the capping station. At this
29 point, the container lid is removed and loaded into the capper. The filling
30 conveyor moves the container backwards to the filling station (Figure 4-5).
31 The container is raised into the fill head that seals against the top of the
32 container, ensuring that no waste material escapes from the container. The
33 discharge valve on the dryer hopper is opened and the dry waste powder from
34 the dryer falls into the container, which is gently vibrated to level the
35 powder. When the quantity of waste in the container reaches a predetermined
36 level (as detected by container weight), the discharge valve is closed and the
37 container lowered. To prevent overfilling the container, a heat probe
38 positioned under the fill head shuts the fill valve if the level of powder [at
39 a temperature of approximately 210 °F (99 °C)] reaches the probe. The filling
40 conveyor moves the filled container to the capping station (Figure 4-6) where
41 the lid is affixed and bolted. The conveyor then moves the container to the
42 cleaning conveyor.
43

44 When the filled and closed containers are parked in front of the cleaning
45 conveyor, the filled containers are moved, one at a time, through the airlock
46 onto the rotator. A manual smear sample is taken to check for radioactive
47 surface contamination. If no contamination is present, the container is
48 labeled and removed from the airlock by conveyor. Labeled containers are
49 weighed, loaded onto pallets, banded, and moved to the filled container
50 storage area using forklifts and container handlers.
51

1 If radioactive contamination is found on the surface of a container, the
2 container is moved by conveyor to the remotely operated washdown station
3 (Figure 4-7). The container is washed with water from the verification tanks
4 and dried with hot air. A manual smear sample is taken again and, if free of
5 contamination, the container is labeled and moved to the filled container
6 storage area. This process can be repeated as needed.
7

8 Additional miscellaneous waste generated by the ETF processes (spent
9 RO membranes, spent resin, used filter elements, spent UV lamps and used HEPA
10 filters) are placed into lined containers, the liner closed, and the container
11 sealed (WHC 1988). These containers are handled in a similar manner to the
12 containers of powdered waste, including being smear tested, labeled, and
13 transferred to the filled container storage area. If a container should fail
14 the smear test, the container either will be washed down to remove the
15 radioactive surface contamination, or the container will be placed in an
16 overpack container.
17

18 Filled containers are closed, labeled, palletized, strapped, and moved
19 into the filled container storage area where the containers remain until
20 transferred to a TSD unit. While stored in the filled container storage area,
21 palletized containers are stacked no more than three pallets high, in rows
22 separated with a minimum of 30-inch (76-centimeter) aisle space. An example
23 storage configuration is shown in Figure 4-8. Palletized containers are moved
24 by forklift.
25

26 **4.2.2.4 Container Storage Area Drainage [D-1b(4)].** All of the containers
27 placed in the filled container storage area are placed on pallets and are kept
28 from contact with any liquid that could be on the floor. The floors of the
29 handling and storage areas are designed as secondary containment systems that
30 slope to drains into sump tank No. 1. The drainage system is designed to
31 avoid standing liquid in the storage area.
32

33 **4.2.3 Protection of Extremely Hazardous Waste in Containers [D-1c]**

34 The powered secondary waste that exits the thin film dryer might
35 designate as an extremely hazardous waste because of toxicity; the waste
36 analysis plan (Appendix 3A) describes the waste designation process. All
37 dangerous waste generated by the ETF is stored within the ETF building in the
38 filled-container storage area. The filled-container storage area has a roof,
39 walls, and a concrete floor, providing complete protection from the weather.
40
41
42

43 **4.2.4 Prevention of Reaction of Ignitable, Reactive, and Incompatible 44 Waste in Containers [D-1d]**

45 The major waste stream generated at the ETF is an acidic inorganic salt.
46 This waste is a dry powder that is collected in lined steel containers that
47 remain closed once filled. Any miscellaneous waste generated at the ETF,
48 produced in far smaller quantities, is compatible with the powdered waste.
49 The additional miscellaneous waste is primarily spent process equipment
50 materials that has been in contact with the waste water being treated. One
51
52

exception is spent UV lamps, which, encased in a quartz sheath, normally do not come in contact with the waste water. Neither the spent materials nor the dangerous constituent (mercury) in the UV lamps are incompatible with other waste generated in the ETF. There is no potential for reaction of ignitable, reactive, or incompatible waste at the ETF.

4.3 TANK SYSTEMS [D-2a, -2a(1)]

All storage and process tanks within the ETF are on or above ground and operate at near atmospheric pressure. Specific tank data, including volume, material of construction, and tank dimensions, are provided in Table 4-1. In addition to these tanks, there are eight process units in the ETF. Table 4-2 presents information on fabrication materials, operating temperatures and pressures, corrosivity and radioactivity for waste, and process liquids in these process units. The approximate location of each tank and process unit is shown in Figure 4-2.

4.3.1 Description of Feed Systems, Safety Cutoffs, Bypass Systems, and Pressure Controls [D-2a(2)]

Descriptions of feed systems, safety cutoff devices, bypass systems, and pressure controls for the tanks and process systems are provided in the following sections.

4.3.1.1 Tanks. All tanks are equipped with liquid level sensors that give a reading of the tank liquid volume. The surge tank, the verification tanks, the secondary waste receiving tanks, and the concentrate tanks are further equipped with liquid level alarms that are actuated if the liquid volume is near the tank overflow capacity. In the actuation of the surge tank alarm, a liquid level switch trips, sending a signal to the valve actuator on the tank influent lines, causing the influent valves to close.

The operating mode for each verification tank, i.e., receiving, holding, or discharging, can be designated through the control system; modes also switch automatically. When the high-level set point on the receiving verification tank is reached, the flow to this tank is diverted and another tank becomes the receiver. The full tank is switched into verification mode. The third tank is reserved for discharge mode.

The liquid levels in the first and second RO feed tanks are maintained within predetermined operating ranges. The RO feed pumps for both the first and second RO feed tanks are designed to operate at 600 pounds per square inch gauge. Should the second RO feed tank overflow, the excess waste water is piped along with any leakage from the feed pump to sump tank No. 2.

The secondary waste receiving tanks receive secondary waste streams and feed the ETF evaporator. When the waste in the designated receiving tank reaches the high-level set point, the influent flow of waste is redirected to the second tank and the first tank becomes the feed tank for the ETF evaporator.

1 In a similar fashion, the concentrate tanks switch modes when the
2 high-level set point of one tank is reached. The other tank switches from a
3 discharging mode to a receiving mode and the first tank becomes the discharge
4 tank feeding waste to the thin film dryer.
5

6 **4.3.1.2 Filter Systems.** The rough filter removes the particulates that are
7 greater than approximately 2 microns and the fine filter removes suspended
8 solids larger than approximately 0.5 micron. The rough filter is supplied by
9 the surge tank feed pumps and the fine filter is supplied by the feed pump on
10 the pH adjustment tank. Both the rough filter and fine filter are in
11 leak-tight steel casings. High pressure, which could damage the filter
12 element, deactivates a valve that shuts off liquid flow to protect the filter
13 element from possible damage. Cleaning the filter is accomplished by pulses
14 of compressed air that force water back through the filter. The cleaning
15 operation takes about 5 minutes and occurs about once a week when the ETF is
16 operating. Cleaning is terminated automatically by shutting off the
17 compressed air supply if high pressure develops.
18

19 **4.3.1.3 Ultraviolet Oxidation System and Decomposers.** A rupture disc on the
20 inlet piping to each of the UV/OX reactors relieves to the pH adjustment tank
21 in the event of excessive pressure developing in the piping system. Should
22 the rupture disk fail, treated water would trip the moisture sensor, shut down
23 the UV lamps, and close the surge tank feed valve. Also provided is a level
24 sensor to protect UV lamps against the risk of exposure to air. Should those
25 sensors be actuated, the UV lamps would be shut down immediately.
26

27 The piping and valving for the decomposers are configured to split the
28 waste water flow: half flows to one decomposer and half flows to the other
29 decomposer. Alternatively, the total waste water flow can be treated in one
30 decomposer or both decomposers can be bypassed. A safety relief valve on each
31 decomposer vessel can relieve excess system pressure to sump tank No. 2.
32

33 **4.3.1.4 Degasification System.** The degasification column is supplied waste
34 water feed by the pH adjustment tank feed pump. This pump transfers waste
35 solution through the hydrogen peroxide decomposer, the fine filter, and the
36 degasification column to the first RO feed tank.
37

38 The degasification column is designed for operation at a partial vacuum.
39 A pressure sensor in the column detects the column pressure. The vacuum in
40 the column is regulated by the pressure controller that adjusts the opening of
41 the air supply valve. The degasification column is exhausted to a blower
42 connected to the heating, ventilation, and air conditioning supply air. If
43 extremely low pressure is developed by the column blower, a situation that
44 could compromise column integrity, a pressure relief safety valve is
45 activated. The column liquid level is regulated by a flow control system with
46 a high- and low-level alarm. A plate-type heat exchanger cools the waste
47 solution fed to the degasification column.
48

49 **4.3.1.5 Reverse Osmosis System.** The flow through the first stage and second
50 stage RO modules is controlled to maintain constant liquid levels in the first
51 and second stage RO feed tanks as described in Section 4.3.1.1.
52

1 4.3.1.6 Polisher. The permeate from the second stage RO unit is pumped to
2 the polisher for removal of dissolved solids. The waste water flows through
3 one IX bed and then through the second IX bed, while the third column is
4 isolated from the treatment line for regeneration.
5

6 When the capacity of the resin in the first column is exceeded, as
7 detected by an increase in the conductivity of the column effluent, the third
8 column, containing freshly regenerated IX resin, is brought online. The first
9 column is taken offline, and the waste water rerouted to the second column,
10 and then to the third. The outlet of each IX vessel is monitored with
11 radiation alarms. Additional monitoring equipment is located at the exit of
12 the RO system. Automatically operated valves are provided to recycle poor
13 quality treated waste water (not meeting the discharge limits) back to the
14 surge tank, if needed, to prevent contamination of the verification tanks.
15

16 4.3.1.7 200 Area Effluent Treatment Facility Evaporator. The ETF evaporator
17 is fed alternately by the two secondary waste receiving tanks. One tank
18 serves as a waste receiver while the other tank is operated as the ETF
19 evaporator feed tank.
20

21 Liquid level instrumentation in the secondary waste receiving tanks is
22 designed to preclude a tank overflow. A liquid level switch actuated by a
23 high-tank liquid level causes the valves to reposition, closing off flow to
24 the secondary waste receiving tanks. Secondary containment for these tanks
25 routes liquids to sump tank No. 1.
26

27 Valves in the ETF evaporator feed line can be positioned to bypass the
28 secondary waste around the ETF evaporator and to transfer the secondary waste
29 to the concentrate tanks.
30

31 4.3.1.8 Thin Film Dryer. The two ETF evaporator concentrate tanks
32 alternately feed the thin film dryer. One tank serves as a concentrate waste
33 receiver while the other tank serves as the dryer feed tank. Liquid level
34 instrumentation prevents tank overflow by diverting the concentrate flow from
35 the full concentrate tank to the other concentrate tank. Secondary
36 containment for these tanks routes liquids to sump tank No. 1.
37

38 An alternate route is provided from the concentrate receiver tank to the
39 secondary waste receiving tanks. Dilute concentrate in the concentrate
40 receiver tank can be reprocessed through the ETF evaporator by transferring
41 the concentrate back to the secondary waste receiving tank.
42

43 4.3.2 Piping, Instrumentation, and Process Flow [D-2a(3)] 44

45 Drawings showing piping and instrumentation for each tank and process
46 system are found in Appendix 4A. Specific pump data are found in Table 4-3.
47 A schematic process flow diagram is provided in Figure 4-3.
48
49
50
51

1 4.3.3 Ignitable, Reactive, and Incompatible Waste [D-2a(4)]
2

3 There is no ignitable or reactive waste treated, generated, or stored in
4 the ETF. High and low pH materials are stored within the ETF, and incoming
5 waste streams might also be of high or low pH. The potential risks of the
6 mixture of incompatible high and low pH materials are discussed for three
7 areas within the ETF where such mixing might occur: (1) the secondary
8 containment of the concentrated chemical feed tanks, (2) the secondary
9 containment of the dilute chemical feed tanks, and (3) the surge tank.

10
11 Two concentrated chemical feed tanks on the outside of the south wall of
12 the ETF Building store 92 weight percent sulfuric acid and 50 weight percent
13 sodium hydroxide. These chemicals are used in various steps of the waste
14 water treatment process to adjust pH. The commingling of spilled material
15 from both tanks would constitute the mixture of incompatible waste. To
16 prevent this occurrence, the tanks are separated by a 4-foot- (1.2-meter-)
17 high concrete berm, and have completely separate concrete secondary
18 containment systems.

19
20 Two smaller tanks inside the ETF Building on the south side contain
21 solutions of 4 weight percent sulfuric acid and 4 weight percent sodium
22 hydroxide. Such dilute concentrations of these acidic and basic materials do
23 not pose any danger to personnel or equipment if spilled material from both
24 tanks were commingled. For this reason, the two tanks are located within a
25 single secondary containment area consisting of a 6-inch- (15.2-centimeter-)
26 high concrete curb and the concrete floor.

27
28 It is possible that a combination of high- and low-pH waste waters could
29 enter the surge tank for treatment, because variability might exist in the
30 waste transferred to the surge tank. To evaluate potential excess heat
31 generated from the mixing of high- and low-pH waste waters, the following
32 scenario is used. (Note that no PUREX waste streams are anticipated for
33 treatment in the ETF; however, to demonstrate the safety of the ETF with a
34 worst-case scenario of potentially incompatible waste, a PUREX waste stream is
35 used in these calculations.) The PC from the 242-A Evaporator and process
36 distillate discharge (PDD) from the PUREX Plant are mixed in the surge tank.
37 The PC has a pH of 11.3. The PDD from the PUREX Plant has a pH of 2.28. The
38 temperature rise from the mixing of PC and PDD was analyzed and found to
39 result in an insignificant rise in surge tank temperature.

40
41 In this scenario, the surge tank is receiving the PC at a rate of
42 75 gallons (284 liters) per minute and the PDD at a rate of 37.5 gallons
43 (142 liters) per minute. The details of these calculations are provided in
44 Appendix 4A. The hydroxyl ion (OH^-) in the high pH solution from the PC
45 reacts with the hydrogen ion (H^+) in the acidic distillate from PDD to form
46 water. The limiting reactant is the hydroxyl ion. By doubling the flow rate
47 of the 242-A Evaporator PC, the moles of hydroxyl ion in the influent almost
48 are equivalent to the moles of hydrogen ion in the PDD (a worst-case
49 scenario). If the total volume of PC is 60,000 gallons (227,124 liters) and
50 the volume of the PDD is 30,000 gallons (113,562 liters), the neutralization
51 reaction would generate 6,059 kilocalories of heat causing the tank

1 temperature to rise a fraction of a degree. Therefore, there would be no risk
2 to equipment or personnel from the combination of high- and low-pH waste
3 waters entering the surge tank.
4

5 Beginning at the surge tank, the pH of the waste water being treated is
6 carefully monitored and controlled. There are no other points in either the
7 primary or secondary treatment train where potentially incompatible waste are
8 managed.
9

10 11 4.3.4 Labels or Signs 12

13 Each piece of equipment in the ETF is identified by a nameplate attached
14 in a readily visible location. Equipment procured as a packaged unit also has
15 a nameplate attached. Included on the nameplate are the equipment number, the
16 equipment title, the manufacturer and the manufacturer's model number, a
17 serial number, and a rating (i.e., capacity, revolutions per minute, torque,
18 range, span, etc.). Nameplates are mounted between control switches and
19 status lights and below other devices on front panels of cabinets and control
20 boxes to identify controls and indicators.
21

22 Caution plates are used to show possible hazards and warn that
23 precautions are necessary. Caution signs have a yellow background and black
24 panel with yellow letters and bear the word "CAUTION". Danger signs show
25 immediate danger and signify that special precautions are necessary. These
26 signs are red, black, and white and bear the word "DANGER".
27

28 Component numbers consist of a five-character alpha numeric string
29 designating the building number followed by a three-character system number, a
30 two-character component-type designator, a one-character sequential number,
31 and a possible letter designator used for identical components performing the
32 same function. (Example: 2025E-60F-TK-2D.)
33

34 Instrument equipment numbers consist of a two-character instrument type,
35 and below this a three-character system number, a three-character sequential
36 number, and a letter designator used for identical components performing the
37 same function.

EXAMPLE:
$$\frac{\text{PI}}{60\text{F } 204\text{G}}$$

38 Equipment numbers for valves consist of a three-character system number
39 and a two-character sequential number. Specialty valves (e.g., air-operated
40 valve, solenoid-operated valve) follow the format for instrument equipment
41 numbers. (Example: 60F-11.)
42

43 Line designation numbers for piping consist of a two-character piping
44 size, a three-character system number, a two-character sequential number, and
45 a four-character piping class number. (Example: 4"-60F-27-1503.)
46

Tanks and vessels containing corrosive waste or corrosive chemicals are posted with black and white signs bearing the word "CORROSIVE". Tanks and vessels containing dangerous waste are posted with hazardous waste labels. In addition, "NO SMOKING" and "DANGER - UNAUTHORIZED PERSONNEL KEEP OUT" signs are posted on all exterior doors of the ETF Building, and on each interior door leading into the process area.

4.3.5 Existing Tank Systems [D-2b]

All tank systems in the ETF are newly constructed. The requirements for existing tank systems are not applicable.

4.3.6 Assessment of New Tank System Integrity [D-2c(1)]

The ETF tank systems for handling dangerous waste are certified by a professional engineer for adequate structural integrity and suitability for the type of waste being handled and the type of treatment process contained (Appendix 4B). Various features of the tank systems are described in the following sections to support this certification.

For the 'packaged systems' procured for use in the ETF, including the filter systems, UV/OX system, degasification system, RO system, ETF evaporator, thin film dryer, and resin dewatering system, the system is required to meet national codes and standards and manufacturers' standards as listed in the following section. In addition, a thorough quality assurance program ensures that the equipment meets all specifications, is tested before shipment, and is inspected and retested before operation. Specific design standards for each of the major systems are discussed in the following section.

4.3.6.1 Design Standards for New Tank and Process System Construction. Specific standards for the manufacture of tanks and process systems installed in the ETF are briefly discussed in the following sections. In addition to these codes and industrial standards, a seismic analysis for each tank and process system is required [173-303-806(4)(a)(xi)]. The seismic analysis is performed in accordance with UCRL-15910 *Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards*, Section 4 (UCRL 1987). The ETF is classified as Hanford Safety Class 3, which corresponds to a Low Hazard/Important Facility Use category in UCRL-15910. Results of the seismic analyses are provided in Appendix 4C.

4.3.6.1.1 Storage and Treatment Tanks. The vertical storage tanks, maintained at or near atmospheric pressure for the storage of liquids within the ETF are specified to meet a series of design standards. The tanks to which these standards apply are as follows:

Surge tank	2025E-60A-TK-1
pH adjustment tank	2025E-60C-TK-1
Effluent pH adjustment tank	2025E-60C-TK-2
First RO feed tank	2025E-60F-TK-1

Second RO feed tank	2025E-60F-TK-2
Verification tanks (3)	2025E-60H-TK-1A/1B/1C
Secondary waste receiving tanks (2)	2025E-60I-TK-1A/1B
Concentrate tanks (2)	2025E-60J-TK-1A/1B
92-weight percent H_2SO_4 storage tank	2025E-65C-TK-1
50-weight percent NaOH storage tank	2025E-65C-TK-2
4-weight percent H_2SO_4 solution tank	2025E-65C-TK-3
4-weight percent NaOH solution tank	2025E-65C-TK-4
Sump tanks (2)	2025E-20B-TK-1/2
Distillate flush tank	2025E-60I-TK-2
Separation tank	2025E-60J-TK-2

The codes and standards applicable to the design, construction, and testing of these tanks and ancillary piping systems are as follows:

ASME - B31.3	Chemical Plant and Petroleum Refinery Piping (ASME 1990)
ASME Sect. VIII, Division I	Pressure Vessels (ASME 1992a)
AWS - D1.1	Structural Welding Code - Steel (AWS 1992)
ANSI - B16.5	Pipe Flanges and Flanged Fittings (ANSI 1992)
ASME Sect. IX	Welding and Brazing Qualifications (ASME 1992b)
API 650	Welded Steel Tanks for Oil Storage (API 1988)
API 620	Design and Construction of Large Welded Low Pressure Storage Tanks (API 1990)
AWWA - D100	Welded Steel Tanks for Water Storage (AWWA 1989)
AWWA - D103	Factory-Coated Bolted Steel Tanks for Water Storage (AWWA 1987)
AWWA - D120	Thermosetting Fiberglass-Reinforced Plastic Tanks (AWWA 1984).

The application of these standards to the construction of ETF tanks and independent verification of completed systems ensures that the tank and tank supports have sufficient structural strength and that seams and connections are adequate to ensure tank integrity. In addition, each tank must meet strict quality assurance requirements. Each tank constructed offsite has been tested for integrity and leak tightness before shipment to the Hanford Facility. Following installation, the systems are inspected for damage to ensure against leakage and to verify proper operation. If a tank were damaged during shipment or installation, leak tightness testing was repeated onsite.

4.3.6.1.2 Filters. The filter vessels are designed to comply with the ASME Section VIII, Division I, Pressure Vessels (ASME 1992a). The filter piping system is designed to withstand the effects of internal pressure, weight, thermal expansion and contraction, and any pulsating flow. The application of these standards to the construction of the ETF filter system and independent inspection ensures that the filter and filter supports have sufficient structural strength and that the seams and connections are adequate to ensure the integrity of the filter vessels.

1 **4.3.6.1.3 Ultraviolet Oxidation System.** The UV/OX reaction chamber is
2 designed to comply with manufacturers standards. The piping system is
3 designed to withstand the effects of internal pressure, weight, thermal
4 expansion and contraction, and any pulsating flow.

5
6 **4.3.6.1.4 Degasification System.** The codes and standards applicable to
7 the design, fabrication, and testing of the degasification column are
8 identified as follows.

9
10 ASME Section VIII, Division I, Pressure Vessels (ASME 1992a)
11 ASME - B31.3, Chemical Plant and Petroleum Refinery Piping (ASME 1990)
12 AWS - D1.1, Structural Welding Code - Steel (AWS 1992)
13 ANSI - B16.5, Pipe Flanges and Flanged Fittings (ANSI 1992)
14

15 The piping for the degasification system is designed to withstand the
16 effects of internal pressure, weight, thermal expansion and contraction, and
17 any pulsating flow.

18
19 **4.3.6.1.5 Reverse Osmosis System.** The pressure vessels are designed to
20 comply with ASME Section VIII, Division I, Pressure Vessels (ASME 1992a), and
21 applicable codes and standards. The piping system is designed to withstand
22 the effects of internal pressure, weight, thermal expansion and contraction,
23 and any pulsating flow.

24
25 **4.3.6.1.6 Polisher.** The IX columns are designed in accordance with ASME
26 Section VIII, Division I, Pressure Vessels (ASME 1992a), and applicable codes
27 and standards. The piping system is designed to withstand the effects of
28 internal pressure, weight, thermal expansion and contraction, and any
29 pulsating flow. Polisher piping is fabricated of type 304 stainless steel or
30 polyvinyl chloride (PVC) and meets the requirements of ASME B31.3, Chemical
31 Plant and Petroleum Refinery Piping (ASME 1990).
32

33 **4.3.6.1.7 200 Area Effluent Treatment Facility Evaporator.** The ETF
34 evaporator is designed to meet the requirements of ASME Section VIII,
35 Division I, Pressure Vessels (ASME 1992a), and applicable codes and standards.
36 The piping is designed to withstand the effects of internal pressure, weight,
37 thermal expansion and contraction, and any pulsating flow. The ETF evaporator
38 piping meets the requirements of ASME B31.3, Chemical Plant and Petroleum
39 Refinery Piping (ASME 1990).
40

41 **4.3.6.1.8 Thin Film Dryer System.** The thin film dryer is designed to
42 meet the requirements of ASME Section VIII, Division I, Pressure Vessels
43 (ASME 1992a), and applicable codes and standards. The piping is designed to
44 withstand the effects of internal pressure, weight, thermal expansion and
45 contraction, and any pulsating flow. The piping meets the requirements of
46 ASME - B31.3, Chemical Plant and Petroleum Refinery Piping (ASME 1990).
47

48 **4.3.6.2 Compatibility of Tanks with Waste to be Handled.** The tank and
49 process systems are constructed of materials that are compatible with the
50 corrosive and radioactive characteristics of the waste. In general, equipment
51 and piping that contain radioactive fluids are made of type 304 or
52 316L stainless steel, PVC, fiberglass-reinforced plastic, or lined with a

material that can be decontaminated (e.g., Teflon¹). Where radioactive concentration is very low, carbon steel is acceptable. For equipment and piping that contain highly corrosive fluids, such as the ETF evaporator bottoms, either 316L stainless steel or Inconel 625² was used. Valves provided at the interface between different piping materials are made of the higher grade material at the interface. Table 4-2 identifies the materials used in fabrication of the tanks, process equipment, piping, and pumps.

4.3.6.3 Corrosion Assessment and Protection. A detailed corrosion potential analysis will be conducted by a National Association of Corrosion Engineers (NACE)-certified corrosion expert. The corrosion analysis report is provided in Appendix 4D.

4.3.6.4 Protection of Underground Tanks from Vehicular Traffic Damage. The only underground tanks at the ETF are the sump tanks, which are part of the secondary containment system described in Section 4.3.8. These tanks are protected by the concrete vaults that contain them, the concrete floor of the ETF Building, and by the building itself. The sump tanks are not vulnerable to damage from vehicular traffic.

4.3.6.5 Assessment of Adequacy of Tank Foundation and Anchoring. Classical theories of structural analysis, soil mechanics, and concrete and structural steel design were used in the design calculations for the foundations and structures of the ETF. Structural calculations are provided in Appendix 4A. In each of the analyses, the major design criteria from the following documents were included:

- V-C018HC1-001 Design Construction Specification,
Project C-018H, 242A Evaporator/PUREX Plant
Process Condensate Treatment Facility
(WHC 1992)
- DOE Order 6430.1A General Design Criteria
- SDC-4.1 Standard Architectural-Civil Design Criteria,
Design Loads for Facilities (DOE-RL 1988a)
- UCRL-15910 Design and Evaluation Guidelines for Department
of Energy Facilities Subjected to Natural
Phenomena Hazards (UCRL 1987)
- UBC-91 Uniform Building Code, 1991 Edition
(ICBO 1991).

¹Teflon is a trademark of E.I. DuPont de Nemours & Company, Wilmington, Delaware.

²Inconel is a trademark of Inco Alloys International, Incorporated, Huntington, West Virginia.

1 The calculations presented in Appendix 4A substantiate the structural
2 designs presented in the construction drawings and specifications. The
3 conclusions drawn from these calculations indicate that the designs are sound
4 and that the specified structural design criteria were met.

5
6 **4.3.6.6 Protection Against Frost Heave.** All tanks at the ETF, other than the
7 sump tanks, are located above ground, on concrete pads, or platforms. All
8 outside tanks are equipped with heaters to prevent the contents from freezing.
9 All piping outside the ETF Building that is not buried below the frost level
10 is heat traced. The sump tanks are located well below the frostline, which is
11 at approximately 18 inches (46 centimeters) below ground surface. In
12 addition, the sump tanks are located within the perimeter of the ETF Building,
13 which has frost barriers on all outside walls and footings. Heat loss through
14 the floor of the building also aids in protecting the sump tanks from frost
15 heave or other damage caused by freezing.

16
17
18 **4.3.7 Description of Tank System Inspection, Verification, and**
19 **Testing Procedures [D-2c(2)]**
20

21 Tanks, piping, and process systems in the ETF were subject to several
22 inspections and tests before waste water was processed. These activities
23 include factory verifications and testing of major tank system components,
24 module functional testing, site installation verifications and testing, module
25 functional testing, and acceptance test procedures, which include operations
26 test procedures as described in the following sections.

27
28 **4.3.7.1 Inspection, Verification, and Testing Phases.** Three phases of
29 construction inspection, verification, and testing were performed on the ETF
30 equipment and systems before the ETF processed waste water. The first phase
31 (onsite) was construction inspection, verification, and testing of components
32 and equipment. In this step, various aspects of the construction of the ETF
33 Building, such as soil and concrete testing, welding inspection, electrical
34 testing, and verification of approved material, equipment, components,
35 configuration, and dimensions were evaluated against applicable codes and
36 standards and the approved design documents. This phase is summarized in
37 Table 4-4. Information presented in Table 4-4 includes various aspects of
38 construction (e.g., soils, concrete, structural steel, instrumentation,
39 piping) and associated codes and standards.

40
41 For each of the 'packaged' systems fabricated offsite, the manufacturer
42 was required to submit a factory inspection and test plan for approval before
43 construction of the unit. This factory inspection and test plan includes
44 verification tests to ensure compliance with codes and standards and proper
45 operation of the equipment, components, and modules that might include testing
46 at full flow and pressures. Factory testing was in accordance with industry
47 standards. Nondestructive examination and testing personnel are required to
48 be qualified in accordance with American Society for Nondestructive Testing
49 recommended practice No. SNT-TC-1A (ASNT 1988).

1 The factory acceptance test for each unit was performed to demonstrate
2 the ability of the system to meet the required specifications, and to
3 demonstrate the proper functioning of the electrical instruments and controls.
4 A leak test was required on all piping to confirm leak tightness. Repair was
5 required for any leaks. To pass, the piping must have no leaks. Electrical
6 examinations include continuity checks and functional tests of controls and
7 instrumentation.

8
9 The second phase of the inspection, verification, and testing procedure
10 was onsite verification and testing. The onsite verification and testing plan
11 includes all process and auxiliary systems assembly and hookup verification,
12 preliminary equipment and module testing, and verifications. The acceptance
13 test procedure includes ensuring that all equipment, components, and systems
14 are properly cleaned, lubricated, supported, and otherwise ready to be
15 functionally tested. Electrical equipment was energized to ensure proper
16 phasing and motor rotation, and other mechanical equipment was operated
17 through applicable ranges to affirm operability. Calibration, grooming, and
18 alignment of equipment also were performed at this time.

19
20 The third phase of inspection, verification, and testing was the onsite
21 acceptance test procedure. The purpose of the acceptance test procedure is to
22 ensure that all software, equipment, and modules function correctly as a
23 system and as intended by the design. Site acceptance testing encompasses all
24 vendor-furnished equipment.

25
26 The acceptance test simulates the actual operating conditions and
27 demonstrates the completeness of the operating manuals for the equipment.
28 Initially, the test was performed with water, followed by testing with a
29 synthetic nonradioactive liquid waste feed containing 430 parts per million of
30 ammonium ion and 110 parts per million of tributyl phosphate, and having a pH
31 of 10.9. Testing with the synthetic feed is conducted over a specified
32 operating range. The acceptance test includes startup, normal operation,
33 demonstration of all abnormal operating conditions, safe shutdown, system
34 flushing, and decontamination.

35
36 Included in the tests are the following equipment:

- 37
38 • Process treatment modules/systems
39 • Integrated test for operation of computer control system
40 • Electrical substation and switchgear
41 • Emergency/backup/safety power
42 • Fire detection and alarm
43 • ETF evaporator and other specialty process equipment
44 • Heating, ventilation, and air conditioning system
45 • Leak detection
46 • Utilities.

47
48 Complete documentation is required of the acceptance testing. This
49 documentation included a narrative that describes in detail the purpose of the
50 test and the expected results, a step-by-step description of procedures,

1 actual results, and an indicator of acceptable performance. Any deficiencies
2 that might be evident in the design or fabrication of the ETF equipment during
3 the test were documented and corrected.

4
5 **4.3.7.2 Backfill Procedures for Underground Tanks.** The sump tanks are the
6 only ETF tanks that are installed below grade. Backfill under the slab and
7 around the concrete vaults that contains the sump tanks are installed and
8 compacted according to the requirements of Washington State Department of
9 Transportation regulations M41-10-88, Section 2-03.3(14)C (WAC 296-155). All
10 other tanks at the ETF are on or above ground.

11
12 **4.3.7.3 Tightness Testing Plans and Procedures.** Examination of all piping
13 systems, joints, and welds was performed before leak/pressure testing was
14 conducted. Methods outlined in ASME B31.3, paragraphs 341 and A341
15 (ASME 1990) (normal service), are used for this examination. Randomly
16 selected finished welds are examined radiographically in accordance with
17 ASME B31.3, paragraph 344.5 (ASME 1990). Leak/pressure testing is performed
18 according to ASME B31.3, paragraph 345 (ASME 1990). Hydrostatic testing is
19 performed before lining the tanks. Hydrostatic testing of piping is conducted
20 in accordance with ASME B31.3, paragraph 345.4 (ASME 1990). Pneumatic testing
21 is performed per ASME B31.3, paragraph 345.5 (ASME 1990), using oil-free air
22 or high-purity nitrogen.

23
24 **4.3.7.4 Support and Protection of Ancillary Equipment.** Pumps are rated for
25 continuous duty and capable of pumping the specified flow range without
26 surging, cavitation, or vibration (WHC 1991). Stable pump operation is
27 provided by motors sized to operate on the pump curve within the limits of
28 stable pump operation. Rotative components of pumps are statically balanced.
29 Mass of a pump and its distribution are such that resonance at normal
30 operating speed is avoided.

31
32 Pipe hangers and supports meet the requirements of Hanford Plant Standard
33 SDC-4.1 (DOE-RL 1988a) and UCRL 15910 (UCRL 1987). Piping systems are
34 designed to withstand the effects of internal pressure, weight, thermal
35 expansion and contraction, and any pulsating flow. All piping is supported
36 and protected using pipe hangers and supports as indicated in the piping
37 drawings. Standard types of manufactured pipe hanger components meet the
38 requirements of MSS SP-58, Hanford Plant Standard SDC-4.1, Section C.2, or as
39 otherwise specified on the design drawings. (Refer to Drawings H-2-89803
40 through H-2-89811 in Appendix 4A). Supports for fiber-reinforced piping and
41 PVC piping are spaced no further than 5 feet (1.5 meters) on center.

44 **4.3.8 Design of Secondary Containment System [D-2d-D-2d(2)]**

45
46 Secondary containment is provided for all tanks and process piping by a
47 coated concrete floor and bermed area. The transfer piping that carries waste
48 water into the ETF is pipe-within-a-pipe construction, and is buried
49 approximately 4 feet (1.2 meters) below ground surface. The pipes between the
50 verification tanks and the verification tank pumps are located in a concrete
51 pipe trench that runs below the road.

1 For the purposes of this discussion, the five secondary containment
2 systems within the ETF are described individually. Each containment area has
3 been given a name associated with the tank or process area it contains.
4 Table 4-5 shows the five containment systems, the equipment each contains, and
5 the relevant materials to be contained.
6

7 4.3.8.1 Design Requirements for Specific Secondary Containment Type

8 (D-2d(1)(c)). The process area and dilute chemical storage containment
9 systems are housed within the ETF Building, which has a jointed concrete slab
10 floor. This floor is 6 inches (15 centimeters) thick with fillers and sealant
11 in all floor joints and at floor/wall joints. There are waterstops at all
12 floor/wall joints and all floor/berm joints. The floors are coated with a
13 multiple-layer chemical-resistant sealant (Appendix 4A). Table 4-6 summarizes
14 the specific types of filler, primer, second, and finish coats specified for
15 the concrete and masonry surfaces in the ETF. This coating protects the
16 concrete floors and berms from contact with any chemical materials that might
17 be harmful to concrete.
18

19 The process area floor is sloped to two separate trenches that each drain
20 to a sump tank located under the floor of the ETF Building (Drawing H-2-89071
21 in Appendix 4A). One trench runs the length of the primary treatment train
22 and drains to sump tank No. 2 located underneath the verification tank pump
23 room floor (Figure 4-2). The second trench collects spillage from the
24 secondary treatment train and flows to sump tank No. 1 located near the
25 ETF evaporator. Both sump tanks are 800-gallon (3,028-liter) double-walled
26 steel tanks, placed inside concrete vaults (Drawing H-2-89065 in Appendix 4A).
27

28 The dilute chemical storage containment system is separated from the
29 process area containment system by a 6-inch- (15-centimeter-) high concrete
30 curb. Waste material from this containment area flows to the sump tanks.
31

32 The concentrated chemical storage containment system is divided into two
33 separate containment areas, one for the sulfuric acid tank and the other for
34 the sodium hydroxide tank. The two areas are defined by a 4-foot-
35 (1.2-meter-) high concrete berm and 6 inch- (15 centimeter-) thick concrete
36 slab on grade that is constructed and coated in the same manner as the
37 ETF Building floor. Each containment area is sloped to a small sump in the
38 corner of the diked area. This containment system is not covered.
39

40 The secondary containment systems for the verification tanks and the
41 surge tank are similar. Each tank is mounted on a concrete ring wall as shown
42 in Drawing H-2-89070, Section 3 (Appendix 4A). Inside the ringwall, the
43 flat-bottomed tank is supported by a bed of compacted sand and gravel.
44 Underneath this sand and gravel bed is a high density polyethylene liner
45 placed on grade and continuously bonded to the ringwall. A drain pipe extends
46 from the sand and gravel bed through the ringwall to the concrete slab
47 surrounding the tank. This pipe collects any leaked material from under the
48 tank and allows for the visual detection of a leak. In each of these
49 containment systems, the concrete slab is sloped to a sump. Liquid collected
50 in the verification tank containment system sump is pumped to sump tank No. 2.
51 Liquid collected in the surge tank containment system sump is pumped to sump
52 tank No. 1. A concrete wall defines the perimeter of both containment

1 systems. The height of the verification tank containment system wall is
2 8 feet 6 inches (2.6 meters). The wall around the surge tank containment area
3 is 9 feet 6 inches (2.9 meters) high.
4

5 Each of these containment areas is designed to contain more than
6 100 percent of the volume of the largest tank in each respective system.
7 Secondary containment systems for the surge tank, verification tanks, and the
8 concentrated chemical storage tanks, which are outside the ETF Building, also
9 are large enough to include the additional volume from a 100-year, 24-hour
10 storm event: 2.1 inches (5.3 centimeters) of precipitation. Information
11 regarding tank and containment system volume is presented in Table 4-7. The
12 calculations supporting this information are provided in Appendix 4A.
13

14 **4.3.8.2 Ability to Prevent Releases to Environment.** The base of each
15 containment system is a steel-reinforced concrete slab. All slab joints and
16 floor and wall joints have waterstops installed at the mid-depth of the slab
17 [Drawing H-2-89067, Detail C (Appendix 4A)]. In addition, filler was applied
18 to each joint, and the entire floor and curb surfaces were coated with an
19 impervious, chemical-resistant sealant (Appendix 4A). This coating is not
20 affected by corrosive materials and prevents the concrete from being in
21 contact with waste material. Table 4-6 presents the coating schedule for
22 concrete and masonry surfaces in the ETF. The concrete bases and curbs are
23 free of cracks, gaps, holes, and other imperfections. Thus, the concrete
24 containment systems do not allow spilled liquid to reach soil or groundwater.
25

26 There are a number of personnel doorways and vehicle access points into
27 the process area. The 6-inch (15-centimeter) concrete curbs are continuous
28 across these access points, preventing the release from the process area of
29 any spilled or leaked material outside the ETF Building.
30

31 **4.3.8.3 Compatibility of Materials of Construction with Waste.** All of the
32 concrete surfaces in the secondary containment systems are coated with a
33 multiple-layer, chemical-resistant epoxy coating (Appendix 4A). This coating
34 material is compatible with the waste being treated in the ETF, and with the
35 sulfuric acid, sodium hydroxide, and hydrogen peroxide additives to the
36 process. The coating protects the concrete that, if not coated, could be
37 affected by continuous or repeated contact with a strong acid.
38

39 **4.3.8.4 Adequacy to Prevent Failure.** All of the secondary containment
40 systems are designed with sufficient reinforcing steel and base and berm
41 thickness to prevent failure caused by pressure gradients, physical contact
42 with the waste, climate conditions, and daily operational stress. Classical
43 theories of structural analysis, soil mechanics, and concrete and structural
44 steel design were used in the design calculations for the foundations and

1 concrete slabs of the ETF secondary containment structures. Structural
2 calculations are provided in Appendix 4A. In each of the analyses, the major
3 design criteria from the following documents were included:

- 4
5 • V-C018HC1-001 Design Construction Specification,
6 Project C-018H, 242A Evaporator/PUREX Plant
7 Process Condensate Treatment Facility
8 (WHC 1992)
9
- 10 • DOE Order 6430.1A General Design Criteria
11
- 12 • SDC-4.1 Standard Architectural-Civil Design Criteria,
13 Design Loads for Facilities (DOE-RL 1988a)
14
- 15 • UCRL-15910 Design and Evaluation Guidelines for
16 Department of Energy Facilities Subjected to
17 Natural Phenomena Hazards (UCRL 1987)
18
- 19 • S-1312-001 Procedure for Seismic Analysis (JGC 1992)
20
- 21 • UBC-91 Uniform Building Code, 1991 Edition
22 (ICBO 1991).
23

24 The calculations presented in Appendix 4A substantiate the structural
25 designs presented in the construction drawings and specifications. The
26 conclusions drawn from these calculations indicate that the designs are sound
27 and that the specified structural design criteria have been met. Calculations
28 demonstrating design adequacy for the high containment walls and the concrete
29 slabs are located in Appendix 4A.
30

31 **4.3.8.5 Adequacy of Foundation.** A soil analysis was conducted to determine
32 allowable soil bearing pressure and soil compaction potential (Dames and
33 Moore 1992). The soil composition was found to include 2 to 3 feet (0.61 to
34 0.91 meter) of loose sand at the surface, about 25 feet (7.6 meters) of dense
35 gravel beneath the sand, and a sequence of very dense well graded sand below
36 the gravel. The bearing capacity of the soil was calculated to be
37 approximately 7,000 pounds per square foot (34,174 kilograms per square
38 meter). The total estimated settling potential is 0.2 to 0.5 inch (0.5 to
39 1.3 centimeters). The total potential differential between footings was
40 calculated to be 0.2 inch (0.5 centimeter). Shear testing indicated that
41 there was no impending shear failure at a maximum applied pressure of
42 10,000 pounds per square foot (48,820 kilograms per square meter) (Dames and
43 Moore 1992).
44

45 Recommendations in the geotechnical report directed that the footings be
46 constructed on the gravel layer, with a minimum size of 2 feet by 2.5 feet
47 (0.61 by 0.76 meter); and that the slabs be constructed on sand or gravel
48 compacted to the 95 percent compaction level (Dames and Moore 1992).
49

50 As mentioned in Section 4.3.8.4, structural theory and specified codes
51 were applied to the design of ETF structures. Design calculations
52 demonstrating the adequacy of the foundation are presented in Appendix 4A.

1 **4.3.8.6 Leak Detection System.** Process unit or tank leaks in the process
2 area are detected visually or electronically. Spilled or leaked material in
3 this area is collected in the two trenches that slope to the sump tanks. Sump
4 pumps are activated by liquid level sensors in the sump tanks. The concrete
5 vaults that house the sump tanks are equipped with moisture detectors
6 (Drawing H-2-88991 in Appendix 4A).
7

8 Leak detection in the dilute chemical storage containment system is
9 accomplished by daily visual inspection. Leak detection in the secondary
10 containment systems for the surge tank, verification tanks, and concentrated
11 chemical storage tanks is accomplished by moisture detectors in the sumps
12 located in the corners of each of these containment areas.
13

14 In addition, the collection pipe located in the sand and gravel bed under
15 the surge tank and the verification tanks is used to visually determine
16 whether these tanks are leaking. Daily visual inspection of the outside of
17 the tanks, the collection pipes, and the concrete base of the secondary
18 containment systems is conducted.
19

20 Leak detection in the transfer lines between the ETF and the
21 242-A Evaporator and the LERF is described in Section 4.3.9.7.
22

23 **4.3.8.7 Collection and Removal of Waste.** Spilled or leaked material from the
24 process area is collected in two trenches that are sloped to the sump tanks.
25 Each sump tank is equipped with two pumps, one of which is activated
26 automatically if the liquid level reaches a preset point. The pumps are
27 intended to alternate operation. If the rate of liquid accumulation in the
28 sump tank is greater than the capacity of one pump to remove it, the second
29 pump can be operated simultaneously. Collected material is pumped from the
30 sump tanks to the surge tank.
31

32 Any accumulation of liquid in the dilute chemical storage containment
33 system is detected visually by process operators. This liquid is
34 characterized and pumped to the appropriate tank using a portable vacuum pump.
35

36 If liquid accumulates in the outdoor secondary containment areas (surge
37 tank, verification tanks, and concentrated chemical tanks), moisture sensors
38 in the sumps activate an alarm light in the control room. The liquid is
39 characterized and pumped out of the containment system by a dedicated, locally
40 operated pump. Liquid collected in the verification tank containment system
41 is pumped into sump tank No. 2. Collected liquid from the surge tank
42 containment system is pumped into sump tank No. 1. Sodium hydroxide is pumped
43 into a portable holding tank or container for disposal. If the liquid is
44 determined not to be dangerous waste, such as clean rain water, the liquid is
45 pumped to the storm drains.
46
47
48

1 **4.3.9 Secondary Containment and Leak Detection for Ancillary**
2 **Equipment [D-d(1)(d)]**
3

4 For nearly all of the ancillary equipment, the secondary containment
5 provided for the tanks and process systems also serves the ancillary equipment
6 associated with these systems. For all of the ancillary equipment housed
7 within the ETF Building, the floor, trenches, and sump tanks comprise the
8 secondary containment system. Piping to and from the dilute and concentrated
9 chemical storage tanks is contained by the respective containment curbs for
10 those four storage tanks. The transfer piping and pipes between the
11 verification tanks and the verification tank pump room are contained in a
12 different manner, as explained in the following sections.
13

14 **4.3.9.1 Description of Secondary Containment for Ancillary Equipment.**

15 Section 4.3.8.1 describes the secondary containment systems that also serve
16 most of the ancillary equipment for the ETF. Between the ETF Building and the
17 verification tanks, there are four pipe trenches that comprise the secondary
18 containment for four lines connecting equipment in the ETF Building with the
19 verification tanks. Treated waste water flows through this piping from the
20 process area to the verification tanks. In addition, there are return lines
21 provided to handle treated waste water that must be reprocessed. Waste
22 accumulated by the secondary containment system for the verification tanks
23 also returns via piping. These pipes are contained in concrete trenches that
24 cross under the road and enter the verification tank pump room.
25

26 The four pipe trenches are each 4 feet (1.2 meters) across, 2.5 feet
27 (0.76 meter) deep, and almost 50 feet (15.2 meters) long. The sides of the
28 trenches are 6-inch- (15-centimeter-) thick concrete, and the concrete bases
29 are 12 inches (30 centimeters) thick. Each pipe trench is covered by a
30 2-inch- (5-centimeter-) high cast iron grating.
31

32 **4.3.9.2 Transfer Piping.** The transfer piping consists of one 3-inch to
33 6-inch pipe-within-a-pipe line that extends from the 242-A Evaporator line to
34 the ETF surge tank, and one 4-inch to 8-inch pipe-within-a-pipe line that runs
35 directly from the LERF to the ETF. These lines each are comprised of a
36 small-diameter inner carrier pipe inside a larger diameter containment pipe.
37 The pipes are made of fiberglass, with leak detection elements located in the
38 annulus between the inner and outer pipes. The leak detectors are located at
39 every 1,000 feet (305 meters) of pipe length. Should moisture be detected,
40 alarms annunciate in the ETF operations room and at the 242-A Evaporator
41 simultaneously, and the influent supply pump shuts off automatically. Leaked
42 material drains into the sump near the surge tank.
43

44 Pipe supports are fabricated of the same material as the pipe, and meet
45 the strength requirements of ASME B31.3 (ASME 1990) for pipe within the
46 containment (outer) piping to prevent sagging or buckling failure under
47 thermal expansion. Containment pipe and carrier pipe have a design pressure
48 of 60 pounds per square inch (7.0 kilograms per square centimeter) gauge, and
49 can accommodate fluid temperatures from 40 to 120 °F (4 to 49 °C).
50
51

1 Waste water is transferred from the 242-A Evaporator to the ETF by a
2 pumping station located and controlled at the 242-A Evaporator. Waste water
3 pumped directly from the LERF basins to the ETF is controlled locally from the
4 LERF switch racks.

5
6 **4.3.9.3 Ability to Prevent Releases to the Environment.** The ability of the
7 major secondary containment systems to prevent releases to the environment is
8 discussed in Section 4.3.8.2.

9
10 The concrete pipe trenches near the verification tanks are placed below
11 grade with their top cast iron gratings even with the road surface, over which
12 vehicles pass. The verification tank end of the trench is sealed by the
13 concrete berm of the verification tank containment system. The other end of
14 the trench penetrates the wall of the building and is open ended. The
15 trenches are sloped towards the ETF Building and drain to the trench in the
16 verification tank pump room, which drains to sump tank No. 2. All joints are
17 constructed with waterstops and sealed as described in Section 4.3.8.2.

18
19 The carrier piping that extends between the 242-A Evaporator and the ETF
20 and between the LERF and the ETF is entirely encased by a larger diameter
21 pipe. Should the inner pipe leak, liquid is contained in the outer pipe, and
22 drains by gravity flow to the sump near the surge tank. Thus, waste water in
23 the transfer piping is not released to the environment.

24
25 **4.3.9.4 Compatibility of Materials of Construction with Waste.** The
26 compatibility of the concrete base and berm systems with the waste materials
27 is discussed in Section 4.3.8.3. The interior pipe trench walls and base are
28 coated with the same multiple-layer, chemical-resistant sealant as described
29 in Section 4.3.8.3. Moreover, the treated waste water is expected to be clean
30 water by the time it reaches the pipeline to the verification tank, containing
31 less than 11 parts per million of organics, no dissolved or suspended solids,
32 and having a total radioactivity of less than 35 picocuries per cubic meter of
33 material (Drawing H-2-88971 in Appendix 4A).

34
35 The piping material was tested previously using SW-846 Method 9090
36 (EPA 1986) to ensure the compatibility of the piping material with the waste
37 water. Results of the 9090 testing are documented in the LERF Part B Permit
38 Application (DOE/RL-90-43).

39
40 **4.3.9.5 Adequacy to Prevent Failure.** The pipe trenches were designed to
41 withstand the load of vehicular traffic. The assumptions used and
42 calculations involved in the design of the pipe trenches are found in
43 Appendix 4A. The transfer piping was designed, constructed, and installed
44 according to industry standards. The purpose of these standards is to ensure
45 against failure of the piping system once the system is loaded. In addition,
46 construction inspections and verification testing affirm that the piping
47 system operates as the design intended, that there are no leaks, and that the
48 leak detection and collection systems are functional.

1 4.3.9.6 Adequacy of Foundation. The calculations used to design the pipe
2 trench can be found in the structural design calculations (Appendix 4A). The
3 adequacy of the foundation of the major components of the secondary
4 containment systems is discussed in Section 4.3.8.5.

5
6 The transfer piping is placed in a trench approximately 4 feet
7 (1.2 meters) deep, lined with 8 inches (20 centimeters) of sand compacted to
8 95 percent. This installation was performed according to specifications.
9 Trenches were kept free of standing water while pipe laying was in progress.
10 In addition, procedures to prevent damage to the piping system were employed,
11 including the use of tools specifically adapted for cutting and fitting
12 fiberglass pipe, care in the making of joints, capping of pipe ends between
13 workdays or when installation was not in progress, proper storage of bonding
14 materials and adhesives, and avoidance of the pipeline/trench area by
15 vehicular traffic. Pipe was protected from sharp objects, impact shocks, and
16 dropping through careful storage and handling. The pipe was inspected
17 visually for damage before laying and any damaged sections were discarded and
18 replaced.

19
20 4.3.9.7 Leak Detection System. Leak detection in the major portions of the
21 secondary containment systems is discussed in Section 4.3.8.6. If a leak
22 should occur in one of the pipes in the pipe trench, the leak would be
23 detected visually through the steel grating or at the entrance of the pipe
24 trench through the pump room wall, by the moisture meter in sump pump No. 2,
25 or by operation of the pump in sump tank No. 2. Visual examination of the
26 pipe trenches, interior trenches, and sump pump operation are performed daily
27 by operations personnel.

28
29 Leak detection in the transfer piping was accomplished by single-point
30 electronic leak detection elements installed at 1,000-foot (305-meter)
31 intervals along the two transfer lines. The leak detection elements are
32 located in the bottom of specially designed test risers. The conductivity
33 sensor in each element was connected via standard mating connectors and sensor
34 cable to a jumper cable leading back to the 242-A Evaporator control room or
35 to the ETF control room. The sensors are corrosion-resistant to acids, bases,
36 and water, and are reusable after exposure to moisture. On detection of a
37 leak in the line, an alarm/locator module sounds an audible alarm and a visual
38 display of the zone number where the leak was detected is indicated. In
39 addition, the pumps are interlocked to the leak detection system and are shut
40 down automatically when a signal is received in the control room. Flow is
41 diverted to a holding tank in the 242-A Evaporator. The transfer piping is
42 equipped with a self-testing system. An external acknowledge button clears
43 the alarm.

44
45 This leak detection system is similar to that employed on the transfer
46 line between the 242-A Evaporator and the LERF (DOE/RL-90-43).

47
48 4.3.9.8 Collection and Removal of Waste. The pipe trenches are sloped to
49 drain to the interior trench in the ETF Building, which drains to sump
50 tank No. 2. Accumulated liquid is pumped automatically from the sump tank to
51 the surge tank, as described in Section 4.3.8.7.

1 If a leak were detected in one of the transfer lines, operations
2 personnel would note the zone indicated by the alarm/locator module and
3 mobilize to the affected zone. Swab risers are located every 100 feet
4 (30 meters) along the transfer lines to facilitate pinpointing and repairing
5 any leak detected by the electronic components, and to facilitate the removal
6 of 242-A Evaporator PC. Starting at the nearest swab riser upstream from the
7 affected leak detection element, maintenance and/or spill personnel would
8 locate the damaged section of pipe. By lowering absorbent material on a rod
9 into a swab riser and withdrawing it, personnel would determine whether any
10 moisture were present at that point. Proceeding upstream, personnel would
11 continue to monitor each swab riser until no fluid were found present at a
12 swab point. The damaged pipe between the last wet swab riser and the first
13 dry swab riser would be excavated and replaced, using proper decontamination
14 and handling procedures.

15 16 17 4.3.10 Variance from Secondary Containment Requirements [D-2d(3)]

18
19 A variance from secondary containment requirements is not requested.
20
21

22 4.3.11 Spill and Overflow Prevention [D-2c]

23
24 Overfill prevention controls used in the ETF include liquid level sensing
25 devices, high-liquid level alarms, automatic feed cutoffs, or other automatic
26 valve controls for the process tanks. These are described in Section 4.3.1.
27 Dry disconnect couplings are used on all chemical feed tank filling
28 operations. A plan and schedule for inspection of this spill and overflow
29 prevention equipment are included in the inspection procedures described in
30 Chapter 6.0.
31
32

33 4.3.12 Compliance With Air Quality Regulations

34
35 The requirements in 40 CFR 264, Subpart AA, apply to permitting for
36 process vents associated with distillation, fractionation, thin film
37 evaporation, solvent extraction, or air or steam stripping operations that
38 manage hazardous waste with organic concentrations of at least 10 parts per
39 million by weight. The ETF includes an evaporation and thin film drying
40 process. However, the concentration of organics in the waste water entering
41 these processes is well below 10 parts per million. Nearly all of the
42 organics will have been destroyed in the UV/OX process, which is upstream of
43 the ETF evaporator and thin film dryer. Therefore, the requirements of
44 Subpart AA do not apply to process vents in the ETF.
45

46 The requirements in 40 CFR 264, Subpart BB, apply to hazardous waste
47 facilities that manage waste streams containing organic concentrations of at
48 least 10 percent by weight. The waste waters entering the ETF will not
49 contain 10 percent or more organics by weight. Therefore, the requirements of
50 Subpart BB do not apply to the ETF.
51

1 The DOE-RL has submitted three air permit applications to the Washington
2 State Department of Health, Washington State Department of Ecology, and EPA,
3 Region 10. Detailed discussions of potential air emissions from the ETF are
4 included in these permit applications and are beyond the scope of this Part B
5 permit application documentation.
6
7

8 4.4 WASTE PILES [D-3] 9

10 Operation of the ETF does not involve the placement of dangerous waste in
11 waste piles. Therefore, the requirements of WAC 173-303-660 are not
12 applicable to the ETF.
13
14

15 4.5 SURFACE IMPOUNDMENTS [D-4] 16

17 Operation of the ETF does not involve the placement of dangerous waste in
18 surface impoundments. Therefore, the requirements of WAC 173-303-650 are not
19 applicable to the ETF.
20
21

22 4.6 INCINERATORS [D-5] 23

24 Operation of the ETF does not involve the incineration of dangerous
25 waste. Therefore, the requirements of WAC 173-303-670 are not applicable to
26 the ETF.
27
28

29 4.7 LANDFILLS [D-6] 30

31 Operation of the ETF does not involve the placement of dangerous waste in
32 landfills. Therefore, the requirements of WAC 173-303-665 are not applicable
33 to the ETF.
34
35

36 4.8 LAND TREATMENT [D-7] 37

38 Dangerous waste constituents and residue have been removed from the ETF
39 waste water by the time the treated waste water reaches the verification
40 tanks. The treated waste water does not exhibit any dangerous waste
41 characteristics and does not contain levels of organic compounds above the
42 state waste discharge permit limits. Samples are collected regularly from the
43 verification tanks and analyzed to verify the success of the treatment process
44 and to confirm that the treated waste water is safe for discharge. The
45 discharge of this waste water to ground is contingent upon approval of a
46 federal delisting petition and regulated through a Washington State waste
47 discharge permit under the authority of WAC 173-216. Thus, operation of the
48 ETF does not involve land treatment of dangerous waste. Therefore, the
49 requirements of WAC 173-303-655 are not applicable to the ETF.

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1
Figure 4-1. 200 Area Effluent Treatment Facility Layout.

H9306023.1

Figure 4-2. 200 Area Effluent Treatment Facility Floor Plan.

FA-2

GEN/061893-B

Figure 4-3. 200 Area Effluent Treatment Facility Process Flow Diagram.

1

Figure 4-4. Plan View of Container Handling Room.

Figure 4-5. Side View of Dryer Powder Hopper and Container Handling Room.

H9306023.4

Figure 4-6. Capping Station.

H9306023.5

1
Figure 4-7. Container Washing and Drying Station.

Figure 4-8. Example Storage Configuration in the Filled Container Storage Area.

Table 4-1. 200 Area Effluent Treatment Facility Tank Systems Information.

Tank description	Tank number	Material	Volume in gallons (liters)	Inner diameter in feet (meters)	Height in feet (meters)
Surge tank	2025E-60A-TK-1	304 SS	100,000 (378,540)	26.0 (7.9)	30.1 (9.2)
pH adjustment tank	2025E-60C-TK-1	304 SS	2,600 (9,842)	10.0 (3.0)	8.2 (2.5)
First RO feed tank	2025E-60F-TK-1	304 SS Carbon steel (saddle)	4,000 (15,142)	10.0 (3.0)	10.6 (3.2)
Second RO feed tank	2025E-60F-TK-2	304 SS Carbon steel (saddle)	2,000 (7,571)	Nonround tank 10 feet (3.0) long x 5 feet (1.5) wide	5.0 (1.5)
Effluent pH adjustment tank	2025E-60C-TK-2	304 SS	2,500 (9,464)	10.0 (3.0)	8.2 (2.5)
H ₂ O ₂ feed tank	2025E-60D-TK-1A	HDPE	2,500 (9,463)	TBD	TBD
Verification tanks (3)	2025E-60H-TK-1A/1B/1C	Carbon steel epoxy lining	670,000 (2,536,218)	60.0 (18.3)	37.5 (11.4)
Secondary waste receiving tanks (2)	2025E-60I-TK-1A/1B	304 SS	15,000 (56,781)	14.0 (4.3)	18.6 (5.7)
Concentrate tanks (2)	2025E-60J-TK-1A/1B	316 L SS	5,000 (18,927)	10.0 (3.0)	12.5 (3.8)
92% H ₂ SO ₄ storage tank	2025E-65C-TK-1	Carbon steel epoxy lining	7,500 (9,464)	10.3 (3.1)	16.3 (5.0)
50% NaOH storage tank	2025E-65C-TK-2	304 SS Carbon steel (support)	5,000 (1,514)	5.0 (1.5)	5.6 (1.7)
4% H ₂ SO ₄ solution tank	2025E-65C-TK-3	FRP Carbon steel (support)	600 (2,271)	5.5 (1.7)	6.3 (1.9)
4% NaOH solution tank	2025E-65C-TK-4	FRP Carbon steel (support)	800 (3,028)	6.0 (1.8)	6.8 (2.1)
Sump tanks (2)	2025E-208-TK-1/2	304 SS	800 (3,028)	Nonround tank 5 feet (1.5) long x 5 feet (1.5) wide	7.8 (2.4)
Distillate flush tank	2025E-60I-TK-2	304 SS	150 (568)	TBD	TBD
Separation tank	2025E-60J-TK-2	TBD	TBD	TBD	TBD

FRP = fiberglass reinforced plastic.
 HDPE = high density polyethylene.
 SS = stainless steel.
 TBD = to be determined.

Table 4-2. Process Equipment, Usage, and Material Data. (sheet 1 of 4)

System	Fluid	Equipment	Material	Design temp °F (°C)	Design pressure (psig)
Surge tank	Waste water	Surge tank	304 SS	200 (93.3)	0
		Feed pumps (A, B, C); piping	304 SS	200 (93.3)	150
Rough filter	Waste water	Rough filter	304 SS	200 (93.3)	150
		Piping	304 SS	200 (93.3)	150
UV oxidation	Waste water	UV oxidizers (A, B) (chamber)	316 SS	160 (71.1)	15
		Piping	304 SS	160 (71.1)	15
	Hydrogen Peroxide	Peroxide feed tank	High density polyethylene	120 (48.8)	75
		Piping	Stainless steel	120 (48.8)	75
pH adjustment tank	Waste water	pH adjustment tank	304 SS	200 (93.3)	0
		Feed pumps (A, B); piping	304 SS	200 (93.3)	150
Peroxide decomposer	Waste water	H ₂ O ₂ decomposer	CS + epoxy lining	200 (93.3)	150
Fine filter	Waste water	Fine filter	304 SS	120 (48.8)	150
		Piping	304 SS	120 (48.8)	150
Degasification unit	Waste water	Degasification column (body)	FRP	120 (48.8)	150
		Piping	304 SS	120 (48.8)	150
Reverse osmosis system	Waste water	Feed tank	304 SS	120 (48.8)	0
		Feed pumps (A, B); piping	304 SS	120 (48.8)	600
		RO units (membranes)	Polyamide	120 (48.8)	600
	Cleaning Agent	RO cleaning agent feed system	Polyethylene	120 (48.8)	75

T4-2.1

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Table 4-2. Process Equipment, Usage, and Material Data. (sheet 2 of 4)

System	Fluid	Equipment	Material	Design temp °F (°C)	Design pressure (psig)
Polisher unit	Waste water	Polishers (A, B, C)	CS + epoxy	120 (48.8)	75
		Resins feed hopper	PVC	120 (48.8)	0
		Resins strainer	304 SS	120 (48.8)	75
Effluent pH adjustment tank	Waste water	Effluent pH adjustment tanks (A, B)	304 SS	120 (48.8)	0
		Effluent pH adjustment pumps (A, B); return pump; piping	304 SS/PVC	120 (48.8)	150
Verification tanks	Waste water	Verification tanks (A, B, C)	CS + epoxy	120 (48.8)	0
Secondary waste receiving tanks	Waste water	Secondary waste receiving tanks (A, B)	304 SS	200 (93.3)	0
		Secondary waste feed pumps (A, B)	304 SS	200 (93.3)	150
		Piping (after feed/ distillate exchanger)	304 SS	230 (110)	150

T4-2.2

Table 4-2. Process Equipment, Usage, and Material Data. (sheet 3 of 4)

System	Fluid	Equipment	Material	Design temp °F (°C)	Design pressure (psig)
ETF evaporator system	Evaporator bottoms	Evaporator body	Inconel* 625	230 (110)	15
		Heater tubes; recirculation piping	Inconel* 625	230 (110)	15
		Recirculation pump	316L SS	230 (110)	15
	Evaporator vapor	Entrainment separator (bottom); evaporator- separator piping	Inconel* 625	230 (110)	15
	Evaporator vapor	Entrainment separator (except for bottom)	316L SS	230 (110)	15
	Evaporator vapor	Vapor compressor; heater (body); piping (heater- distillate flush tank)	304 SS	230 (110)	75
	Evaporator distillate	Distillate flash tank	304 SS	230 (110)	15
		Distillate flash tank pump; piping	304 SS	230 (110)	75
Thin film dryer	Evaporator bottoms	Concentrate tanks (A, B)	316L SS	230 (110)	0
		Concentrate circulation pumps (A, B); piping; concentrate feed pump	316L SS	200 (93.3)	75
	Waste powder	Thin film dryer (inner wall)	Inconel* 625	400 (204.4)	0
		Powder hopper	316L SS	370 (187.7)	0
	Dryer vapor	Spray condenser; piping (dryer-spray condenser)	316L SS	230 (110)	0
		Piping (spray condenser distillate)	304 SS	230 (110)	75

T4-2.3

Table 4-2. Process Equipment, Usage, and Material Data. (sheet 4 of 4)

System	Fluid	Equipment	Material	Design temp °F (°C)	Design pressure (psig)
Resin dewatering system	Spent resin	Resin dewatering unit; piping	304 SS/PVC	120 (48.8)	0
Vessel offgas system		VOG filter unit	304 SS/CS	120 (48.8)	0
		VOG blowers (A, B); piping	304 SS/CS	120 (48.8)	2
	Offgas	Piping	CPVC	120 (48.8)	0

CPVC = chlorinated polyvinyl chloride.

CS = carbon steel.

FRP = fiberglass reinforced plastic.

PVC = polyvinyl chloride.

RO = reverse osmosis.

SS = stainless steel.

UV = ultraviolet.

VOG = vessel offgas.

*Inconel is a trademark of Inco Alloys International, Incorporated, Huntington, West Virginia.

Table 4-3. 200 Area Effluent Treatment Facility Pump Information.

Pump description	Equipment no.	Material	Nominal capacity gallons (liters) per minute
Surge tank pumps (3)	2025E-60A-P-1A/1B/1C	304 SS	180 (681)
pH adjustment tank pumps (2)	2025E-60C-P-1A/1B	304 SS	220 (833)
First RO feed tank pumps (2)	2025E-60F-P-1A/1B	304 SS	250 (946)
Second RO feed tank pumps (2)	2025E-60F-P-2A/2B	TBD	190 (719)
Effluent pH adjustment pumps (2)	2025E-60C-P-2A/1B	304 SS	175 (662)
Return pump	2025E-60H-P-1	304 SS	300 (1,136)
Secondary waste feed pumps (2)	2025E-60I-P-1A/1B	304 SS	180 (681)
Recirculation pump	2025E-60I-P-2	TBD	TBD
Distillate flush tank pump	2025E-60I-P-3	TBD	23 (87)
Concentrate transfer pump	2025E-60I-P-4	TBD	20 (76)
Concentrate circulation pumps (2)	2025E-60J-P-1A/1B	316L SS	35 (132)
Concentrate feed pump	2025E-60J-P-2	TBD	TBD
Dryer distillate pump	2025E-60J-P-3	TBD	32 (121)
Sump pumps (4)	2025E-208-P-1A/1B/2A/2B	304 SS	50 (189)
92% H ₂ SO ₄ feed pump	2025E-65C-P-1	TBD	10 (38)
50% NaOH feed pump	2025E-65C-P-2	TBD	10 (38)
4% H ₂ SO ₄ solution feed pump	2025E-65C-P-3	TBD	15 (57)
4% NaOH solution feed pump	2025E-65C-P-4	TBD	20 (76)
Discharge pumps (2)	TBD	TBD	300 (1,136)
Resin dewatering system pump	2025E-80E-RDS-1	TBD	TBD

SS = stainless steel.
TBD = To be determined.

Source: Ref. 23

Table 4-4. Summary of Construction Inspection and Testing for the 200 Area Effluent Treatment Facility. (sheet 1 of 2)

Construction element	Requirements	Code, standard, or specification
Soils	Soil compaction procedure demonstration	Section 02223, Specification S-1131-103
	Placement of backfill	WSDOT M41-10-88
	Compaction control testing	WSDOT M41-10-88, Section 2-03.3(14)D
Concrete	Concrete materials, mix designs, and mix proportions	ACI 301-89, 3.8 and 16.7.3
	Minimum compressive strength for structural applications	4,000 psi, Specification S-1131-103, Division 3
	Pre-placement quality control: inspect forms, reinforcing steel, imbeds, waterstops	ACI-301-89, Specification S-1131-103, Division 3
	Placement quality control: compliance with ACI, batch times, truck revolutions, freefall, testing (air, slump, temperature, test cylinders)	ACI 301-89, Sections 16.3.4, 16.3.5, 16.3.6, 16.3.8
	Post-placement quality control: compliance with ACI-301, curing and protection	ACI-301-89, Specification S-1131-103, Division 3
Structural steel	Approved welding procedures and qualified, certified welders	AWS D1.1 or ASME Section IX
	Visual weld examinations and documentation of those examinations performed by certified welding inspectors	Certification per AWS QC-1-88
	Quality control: fasteners, anchor bolts, erection	AISC and AWS D1.1
Sealants (process, secondary containment)	Material verification, application verification	Section 07900, Specification S-1131-103
Special protective coatings	Ensure compliance to submitted and approved procedure for application, repair, maintenance, and inspection	Section 09805, Specification S-1131-103
Pre-engineered structures	Ensure fabrication and erection to approved fabrication and erection design documents	Specification S-13G1-001
Process instrumentation	Material verification, installation verification	Specification S-1131-103, Division 17
	Welding, bonding, leak pressure testing, assembly, erection	ASME B31.3, Normal Service, 341.4.1
	Calibration verification	Specification S-1131-103, Division 17
	Electrical inspection and verification	Specification S-1131-103, Division 17
Fire protection	Ensure compliance with code. Document on Contractor's Material and Test Reports	NFPA 13, 14, and 24
Utility piping systems: steam, service/instrument air, cooling water, seal water, demineralized water	Material verification, installation verification	S-1131-103, Division 15
	Compliance with industrial standard	ASME B31.1, Chapter VI
	Visual weld examination by certified weld inspectors	Certification per AWS QC-1-88

Table 4-4. Summary of Construction Inspection and Testing for the 200 Area Effluent Treatment Facility. (sheet 2 of 2)

Construction element	Requirements	Code, standard, or specification
Process piping systems: primary and secondary waste piping, tanks, vessels, and chemical addition piping and tanks	Piping: compliance with industrial standard	ASME B31.3, 341.4.1, Normal Service
	Final visual weld/bond examination on all completed welds/bonds, performed by certified welding inspectors	Certification per AWS QC-1-88.
	Tanks: compliance with standards	API 650, API 620; AMMA D100, D103, D120
	Vessels: compliance with standards. Code stamping required	ASME Section VIII, Division 1
	Independent assessment of completed new tank system (tanks, vessels, ancillary equipment)	MAC 173-303-640
Heating, ventilation, and air conditioning (process area, supply/exhaust, vessel offgas system)	Process exhaust and vessel offgas system compliance with standards	ASME N509 and N510
	Final visual weld examination by certified welding inspectors	Certification per AWS QC-1-88
Electrical	Compliance with codes	S-1131-103, Division 16
	Inspection and testing	S-1131-103, Division 16
Post-construction testing	Onsite verification and testing and ETF acceptance test procedures	S-1510-005
Government acceptance inspection (Kaiser Engineers Hanford Company acceptance inspection)	Kaiser Engineers Hanford Company performed overview verifications and tests during construction and Acceptance Test Procedure to verify compliance with approved design documents and ensure that systems operate as intended by the design	Kaiser Engineers Hanford Company Independent Assessment Plans
	Kaiser Engineers Hanford Company performed the independent assessment of construction of the transfer piping (LERF to ETF)	Kaiser Engineers Hanford Company Independent Assessment Plans

ACI = American Concrete Institute.
 AISC = American Institute of Steel Construction.
 API = American Petroleum Institute.
 ASME = American Society of Mechanical Engineers.
 ATP = Acceptance Test Procedure.
 AWS = American Welding Society.
 NFPA = National Fire Protection Association.
 psi = pounds per square inch.
 MAC = Washington Administrative Code.
 WSDOT = Washington State Department of Transportation.
 NOTE: For reference information see Chapter 15.0, References, of this document.

Table 4-5. Secondary Containment Systems.

Containment system	Equipment contained	Materials contained
Surge tank	Surge tank	PC, PDD, ASD, waste from LERF
Process area	UV oxidation units, rough and fine filters, pH adjustment tank, H ₂ O ₂ decomposer, degasification column, RO system, resin dewatering system, filled drum storage area, decontamination shop, personnel decontamination room, hot electrical instrumentation shop, laboratory area, HEPA filter room, truck bay, hot maintenance, verification tank pump room	PC, PDD, ASD, dilute sulfuric acid, dilute sodium hydroxide, ammonium sulfate powder
Concentrated chemical storage (outside)	Concentrated chemical feed tanks	Concentrated sulfuric acid, concentrated sodium hydroxide
Dilute chemical storage (inside)	Dilute chemical feed tanks	Dilute sulfuric acid, dilute sodium hydroxide
Verification tanks	Verification tanks	Treated waste water
Transfer piping	Piping from 242-A Evaporator and from the LERF to the ETF	PC, PDD, ASD, waste from the LERF
Pipe trenches	Piping from the verification tank pump room to the verification tanks	Treated waste water

ASD = ammonia scrubber distillate.
 ETF = 200 Area Effluent Treatment Facility.
 HEPA = high-efficiency particulate air.
 LERF = Liquid Effluent Retention Facility.
 PC = process condensate.
 PDD = process distillate discharge.
 RO = reverse osmosis.
 UV = ultraviolet.

Table 4-6. Concrete and Masonry Coatings.

Coating	Minimum wet film thickness (mil)	Percentage of film forming solids per volume (%)	Minimum dry film thickness (mil)
Concrete and masonry			
Prime: Amercoat-187*	4.5	22.0	1.0
Second: Amercoat-33	6.4	23.46	1.5
Finish: Amercoat-33	6.4	23.46	1.5
or			
Prime: Amercoat-385	5-6	66	3-4
Topcoat: Amercoat-450HS	3-4	66	2-2.5
High traffic, drum storage area			
Filler: Ameron Nu-Klad 114A**	--	100	--
Prime: Amercoat-105A	2-3	100	2-3
Topcoat: Amercoat-120	20-30	100	20-30

*Amercoat is a trademark of Ameron, Incorporation.

**Nu-Klad is a trademark of Ameron, Incorporation.

Table 4-7. Volume of Secondary Containment Systems.

Containment system	Volume of containment system in gallons (liters)	Volume of largest vessel in gallons (liters)
Surge tank	195,380 (739,600)	100,000 (378,540)
Process area	76,186 (288,394)	15,000 (56,780)
Concentrated chemical storage (outside)	9,574 (36,241) 14,661 (55,498)	400 (1,510) 2,500 (9,460)
Dilute chemical storage (inside)	1,563 (5,917)	800 (3,028)
Verification tanks	1,012,320 (3,832,000)	670,000 (2,536,200)
Transfer piping	Not applicable	Not applicable
Pipe trenches	3,700 (14,006)	Not applicable

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5.0 GROUNDWATER MONITORING [E] 5-1

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5.0 GROUNDWATER MONITORING [E]

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The ETF is not operated as a dangerous waste surface impoundment, waste pile, land treatment unit, or landfill as defined in WAC 173-303-645(1)(a). Therefore, groundwater monitoring is not required.

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6.0 PROCEDURES TO PREVENT HAZARDS [F]

This chapter describes the security, inspection schedules, preparedness and prevention requirements, preventive procedures, structures, and equipment, and prevention of reaction of ignitable, reactive, and incompatible waste for the ETF.

6.1 SECURITY [F-1]

The following sections describe the security measures, equipment, and warning signs used to control entry to the ETF.

6.1.1 Security Procedures and Equipment [F-1a]

The following sections describe the 24-hour surveillance system, barriers, and warning signs used to provide security and control access to the ETF.

6.1.1.1 24-hour Surveillance System [F-1a(1)]. The entire Hanford Facility is a controlled-access area. The Hanford Facility maintains around-the-clock surveillance for protection of government property, classified information, and special nuclear material. The Hanford Patrol maintains a continuous presence of protective force personnel to provide additional security.

6.1.1.2 Barrier and Means to Control Entry [F-1a(2),(2a),(2b)]. Manned barricades are maintained around the clock at checkpoints on vehicular access roads leading to the 200 Areas of the Hanford Facility. All personnel accessing these areas must have a U.S. Department of Energy-issued security identification badge indicating the appropriate authorization. Personnel also might be subject to a search of items carried into or out of these areas.

The ETF has additional levels of protection. Persons desiring entry to the ETF are directed to pass through an additional checkpoint at the ETF control room. Personnel assigned to the ETF monitor all persons entering the ETF and notify the Hanford Patrol of any attempted unauthorized entry. Immediate Hanford Patrol response maintains the necessary ETF security.

The perimeter of the ETF is fenced to isolate the ETF from other areas on the Hanford Facility. Gates provide access for authorized vehicles and personnel.

6.1.1.3 Warning Signs [F-1a(3)]. Signs bearing the legend "DANGER--UNAUTHORIZED PERSONNEL KEEP OUT," are posted around the perimeter of the ETF. The signs are in English, legible from a distance of 25 feet (7.6 meters), and are visible from all angles of approach.

1 6.1.2 Waiver [F-1b,b(1),b(2)]
2

3 Waivers of the security procedures and equipment requirements for the ETF
4 are not requested. Therefore, the requirements of WAC 173-303-310(1)(a) and
5 (b) are not applicable to the ETF.
6
7

8 6.2 INSPECTION SCHEDULE [F-2]
9

10 This section describes the method and schedule for inspection of the ETF.
11 The purpose of inspections at the ETF is to help ensure that situations do not
12 exist that might cause or lead to the release of dangerous and/or mixed waste
13 that could pose a threat to human health and the environment.
14
15

16 6.2.1 General Inspection Requirements [F-2a,a(1),a(2)]
17

18 An inspection schedule is maintained at the ETF. This section describes
19 the schedule for the inspection of monitoring equipment, safety and emergency
20 equipment, security devices, and operating and structural equipment that are
21 vital to prevent, detect, or respond to human health and environmental
22 hazards. The inspection schedule identifies the types of problems and
23 describes the frequency of inspection for items on the schedule. The
24 frequency of inspection is based on the rate of possible deterioration of
25 equipment and the probability of a human health and environmental incident if
26 the deterioration, malfunction, or operator error goes undetected. Visual
27 inspection schedules are provided in Tables 6-1 through 6-4.
28
29

30 6.2.2 Specific Process Inspection Requirements [F-2b]
31

32 The following sections describe specific process inspection requirements.
33 The process equipment inspection plan consists of three inspection plans: a
34 visual inspection plan, an instrumentation monitoring plan, and a preventive
35 maintenance plan. These inspection plans are discussed in this section.
36

37 6.2.2.1 Visual Inspection Plan [F-2b(1), F-2b(2)(a), F-2b(2)(b), F-2b(2)(c),
38 F-2b(2)(d)]. The visual inspection plan provides direction to the ETF process
39 operators, outlines the frequency of inspections, itemizes the components to
40 inspect, and details the types of problems to inspect. An inspection log is
41 maintained and contains the following information at a minimum:
42

- 43 • Date of the visual inspection
- 44
- 45 • Time of the inspection
- 46
- 47 • Printed name of the inspector
- 48
- 49 • Signature of the inspector
- 50
- 51

- Notations of the observations made
- Date and nature of any repair or remedial actions taken as a result of the inspection.

Any problems observed are remedied on a schedule that prevents hazards to human health and the environment. Imminent hazards are remedied immediately. Wherever visual access is possible, inspections of the following equipment are performed regularly:

- Process equipment, tanks, containers, piping, structures
- Safety equipment, including safety showers and eyewashes
- Emergency equipment, including fire suppression systems.

6.2.2.2 Instrumentation Monitoring Inspection Plan [F-2b(2)(a), F-2b(2)(b), F-2b(2)(c), F-2b(2)(d). In radioactive areas, many inspections are performed remotely. Monitoring instruments are connected to audible alarms and the visual indicators track alarm status. The monitoring system provides trending of selected monitoring data, graphic, and equipment summary displays.

After an alarm is activated, the process operator responds in accordance with the applicable operating procedure. All system messages, alarm messages, operator input, and special messages are printed. Additionally, an alarm history file records all system events and the time of occurrence on a fixed-disk system. The file is downloaded to data storage disks.

6.2.2.3 Preventive Maintenance Plan. The ETF is maintained by maintenance personnel common to the 200 East Area, but with ETF-specific training. The maintenance personnel receive ETF-specific training to ensure they are familiar with the ETF operations and their specific tasks (Chapter 8.0).

A preventive maintenance recall system is employed as a tool to direct preventive maintenance activities at the ETF. Equipment requiring maintenance is checked at least annually and could be checked every 30, 90, or 180 days depending on the maintenance history and the manufacturer's recommendations.

The preventive maintenance of certain equipment might not be possible if the ETF is in an operational mode. Thus, the preventive maintenance could be performed slightly earlier or later than planned to minimize impact on ETF operations.

The ETF instrumentation is calibrated regularly to ensure accuracy and reliability. All process control instrumentation is calibrated at least annually. Specific instruments are calibrated semiannually or monthly, depending on previous calibration experience. An instrument calibration and recall system is employed as a tool to manage plant calibrations. This system not only directs instrument technicians to perform regular calibrations but also evaluates the frequency of each instrument calibration. The frequency of calibration could be increased if a particular instrument often is found to be out of calibration. Likewise, a calibration frequency could be decreased if justified by a good calibration history. To prevent hazards resulting from

1 operator or computer error, random calibration surveillances are performed by
2 trained quality assurance inspectors independent of ETF operations.
3
4

5 6.3 WAIVER OR DOCUMENTATION OF PREPAREDNESS AND PREVENTION 6 REQUIREMENTS [F-3] 7

8 The following sections document the preparedness and prevention measures
9 used at the ETF.
10

11 6.3.1 Equipment Requirements [F-3a] 12 13

14 The following sections describe the internal and external communications
15 and emergency equipment located at the ETF.
16

17 6.3.1.1 Internal Communications [F-3a(1)]. The ETF is equipped with an
18 internal communication system to provide immediate emergency instruction to
19 personnel. The onsite communication system at the ETF includes telephones,
20 radios, a public address system, and alarm systems. The telephone and radio
21 systems provide for intraplant communication as well as external
22 communication. Provisions are made to appropriately respond to various
23 emergencies, including the following alarm-activated emergency situations:
24 building evacuations, fire and/or explosion, loss of essential services, loss
25 of ventilation, radioactive discharges, and high airborne contamination.
26 Chapter 7.0 contains reference to these response activities.
27

28 Immediate emergency instruction to personnel is provided by a public
29 address system via speaker horns and ceiling-mounted speakers located
30 throughout the building. The public address system is coupled to building
31 telephone systems to provide telephone accessed voice paging. The ETF alarms
32 are annunciated via elements of the public address system. The general
33 telephone system, which carries various communication signals (e.g.,
34 telephone, crash alarm), is linked to the Hanford Site integrated voice data
35 telecommunications system.
36

37 6.3.1.2 External Communications [F-3a(2)]. The ETF is equipped with devices
38 for summoning emergency assistance from the Hanford Fire Department and/or
39 local emergency response teams as necessary. External communication is made
40 via a telephone communication system or two-way radios.
41

42 Telephones are provided at numerous locations throughout the ETF. In
43 addition, the following external communication systems are available for
44 notifying persons assigned to emergency response organizations:
45

- 46 • Fire alarm pull boxes and fire sprinkler flow monitoring devices--
47 connected to a system monitored around the clock by the Hanford Fire
48 Department
49
- 50 • Telephone number 911--contact point for the Hanford Site; on
51 notification, the Hanford Patrol Operations Center notifies and/or
52 dispatches required emergency responders

- Telephone number 373-3800--single point of contact for the emergency duty officer; this number can be dialed from any Hanford Facility telephone
- Crash alarm telephone system--consists of selected telephones that automatically are disassociated from the regular system and connected to control stations
- Priority message system (Management Bulletin)--a network of telefax machines used to disseminate information to personnel
- The DOE-RL radio system--radio systems and frequencies available for emergency communications.

6.3.1.3 Emergency Equipment [F-3a(3)]. Emergency equipment is available for use throughout the ETF. The Hanford Facility relies primarily on the Hanford Fire Department to control fires. The Hanford Fire Department is capable of providing rapid response to fires within the 200 East Area. Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment are available at various locations in the ETF. Personnel are trained in the use of emergency equipment (Chapter 8.0). The Hanford Facility maintains a sufficient inventory of heavy equipment (i.e., bulldozers, cranes, road graders) for emergency response.

Fire control equipment is available at the ETF and could include the following:

- Fire extinguishers (all-utility use, dry chemical), good for use on small fires (Chapter 7.0)
- Automatic fire suppression systems installed in the ETF control room and electrical room
- Fire alarm pull boxes (Chapter 7.0)
- A water spray system is installed in the operating and administrative portions of the ETF.

Respirators, hazardous material protective gear, and special work procedure clothing for ETF maintenance personnel are kept in the change room at the ETF. Safety showers are located in convenient locations in the ETF. Portable emergency eye washes are used at the ETF. Water for these devices is supplied from the ETF sanitary water system.

6.3.1.4 Water for Fire Control [F-3a(4)]. Water for fire protection is supplied from the 200 East Area raw water system. The 200 Areas are serviced by two water distribution systems. One is for domestic water use (sanitary water) and one is for process and firewater (raw water).

The water is pumped from the Columbia River at the 100D and 100B Areas and piped underground to the 200 East and 200 West Areas. The water from the Columbia River is received at the 200 East Area reservoir. The water in the

1 reservoir is then pumped into the 200 East Area raw water distribution grid
2 and to the 200 East Area filter house for treatment. The filtered water is
3 then pumped to the 200 East Area sanitary water distribution grid.
4

5 The ETF is serviced by two 12-inch raw water lines that are tied into the
6 200 East Area raw water distribution grid. These lines provide a looped
7 configuration that supplies two independent sources of raw water for fire
8 protection and raw water uses. The ETF also is supplied with one 4-inch
9 sanitary water line that provides domestic water. Connections from the
10 ETF Building raw water system supply fire hydrants and the wet-pipe sprinkler
11 system.
12
13

14 6.3.2 Aisle Space Requirement [F-3b]

15
16 Sufficient aisle space (fire lanes) are maintained on the exterior of the
17 ETF to allow unobstructed access of personnel and equipment responding to
18 fires, spills, or other emergencies. Drawing H-2-69267 in Appendix 4A
19 contains ETF site plans. Aisle space requirements are based on the National
20 Fire Protection Association Codes or other national building standards as
21 appropriate.
22

23 The ETF is designed with sufficient aisle space to allow access by
24 emergency response personnel to all systems. Aisle space at the ETF meets the
25 requirements of the National Fire Protection Association Life Safety Code
26 (NFPA 1989) and WAC 173-303-630(5c).
27
28

29 6.4 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT [F-4]

30
31 The following sections describe preventive procedures, structures, and
32 equipment.
33
34

35 6.4.1 Spill Prevention and Control

36
37 This section discusses the prevention of dangerous waste spills or leaks
38 during the loading and unloading of chemicals and waste and during transfers
39 into and out of the ETF. The potential for spills or leaks was considered
40 during ETF design, and features were incorporated into the ETF to minimize the
41 possibility of spills or leaks.
42

43 6.4.1.1 Loading and Unloading Operations [F-4a]. Trucks that transfer
44 liquids into the chemical makeup tanks are equipped with spill collection or
45 drip pans to catch minor leaks. The fill system is monitored continuously
46 during tank-filling operations and filling is stopped immediately if leaks
47 occur. Care is taken to ensure that even minor leaks are cleaned up
48 immediately and disposed of in accordance with approved management procedures.
49

50 6.4.1.2 Waste Transfer Lines. Pipelines that transfer liquid waste are
51 encased in a second pipe or contained in piping process pits and are equipped
52 with leak detection instruments to alert ETF operators of abnormal conditions.

1 6.4.2 Run-Off [F-4b]
2

3 Run-on and run-off controls will be maintained throughout the life of the
4 ETF. Dangerous waste and hazardous chemical handling areas are designed to
5 contain spills, leaks, and wash water, thereby preventing run-off and
6 subsequent releases. All dangerous waste and hazardous chemical loading and
7 unloading areas are provided with secondary containment structures as
8 described in Chapter 4.0. Chapter 2.0 contains additional discussion of the
9 specific measures to prevent environmental contamination from run-off.
10

11
12 6.4.3 Surface and Groundwater Contamination Prevention [F-4c]
13

14 Water supplies for the Hanford Facility are taken from the Columbia
15 River. There are no drinking water wells near the ETF or near the SALDS.
16 Therefore, a release would not immediately contaminate drinking water
17 supplies. The ETF uses procedures, structures, and equipment to prevent the
18 contamination of natural water supplies (i.e., groundwater and surface water).
19 The ETF is monitored during operation to detect abnormal conditions, and is
20 inspected regularly to detect equipment and structural deteriorations that
21 could allow water supply contamination. One function of the monitoring system
22 is to detect releases or the potential for releases that could contaminate
23 water supplies.
24

25 Because radiation exposure to operating personnel must be minimized,
26 areas in contact with the waste are monitored remotely and continuously
27 through a series of level and pressure indicators, leak and radiation
28 detection alarms, equipment failure alarms, and control panel readouts. Data
29 are fed to the distributed control system for review by operations and
30 management personnel. Computerized data collection of all alarms and events,
31 and air monitoring data are used to ensure that a complete record of the ETF
32 operation is maintained. In addition, the ETF is inspected regularly for the
33 presence of leaks or other offnormal conditions wherever possible.
34

35 In addition to detailed operating procedures, structures and equipment
36 are used at the ETF to prevent contamination of water supplies. The
37 structures and equipment designed to prevent contamination of water supplies
38 are the same as the structures and equipment used to prevent run-off from
39 dangerous waste handling areas.
40

41
42 6.4.4 Equipment and Power Failures [F-4d]
43

44 The incidents considered in the design of the ETF include power loss or
45 equipment failure. Equipment failure most often is isolated to a single piece
46 of equipment unless that failure triggers other failures. The procedures,
47 structures, and equipment used to mitigate the effects of equipment failure
48 and power outage are described in the following sections.
49

50 6.4.4.1 Equipment Failure. A combination of reliability, redundancy,
51 maintenance, and repair features are used in the ETF equipment and systems to
52 minimize random failure of equipment.

1 For crucial systems such as ventilation filters, redundant trains are
2 provided to mitigate equipment and system failure. Spare parts are maintained
3 for essential production and safety equipment.
4

5 **6.4.4.2 Power Failure.** The ETF does not have a standby power source.
6 Selected lighting has a battery backup. Power to computers and process
7 controls is configured with an uninterruptible power supply. During partial
8 loss of normal power, the effected pumps and subsystems will be shut down.
9 The subsystems are designed to be redundant (pumps, columns, and filters) to
10 allow the process to continue to operate when only one component is out of
11 service. The surge tanks provide time for the operators to switch-off and
12 valve-out the pump shutdown because of an electrical failure and to valve-in
13 and start the spare pump. This action restores the process to normal
14 operation quickly and efficiently with inconsequential effect on the ability
15 of the process to clean up the waste water flowing through the process.
16

17 Complete loss of power to the ETF shuts down the entire ETF except for
18 the instruments in the control room connected to the uninterruptible power
19 supply (10 minutes of operation). When power at the ETF is lost, the valves
20 will return to the normal position to allow the process to remain in a safe
21 shutdown mode until restoration of power. This action allows the operators to
22 perform equipment surveys during shutdown and to confirm that there are no
23 safety issues because the ETF is shut down.
24

25 When normal power is restored after a partial or complete loss of power,
26 the ETF processing rate will be increased to compensate for volume increases
27 in any of the holdup basins, tanks, or systems. The time required for return
28 to normal operation depends on the downtime and the flow rates during the
29 downtime.
30

31 32 **6.4.5 Personnel Protection Equipment [F-4e]** 33

34 At the ETF, procedures, structures, and equipment are used to prevent
35 undue exposure of personnel to dangerous waste and hazardous materials. All
36 operations are conducted such that employee exposure to dangerous waste and
37 hazardous and radioactive material are maintained ALARA. Also, the ETF has
38 eyewash stations and safety showers in convenient locations for use by
39 personnel. The following structures and equipment were incorporated into the
40 ETF design to minimize personnel exposure.
41

- 42 • Offices, control room, clean- and soiled-clothes storage areas, change
43 rooms, and the lunchroom are situated to minimize casual exposure of
44 personnel.
45
- 46 • Building exit pathways are located to provide rapid egress in the
47 event of emergency evacuations.
48
- 49 • Emergency lighting devices are located strategically throughout the
50 ETF.
51

- Audio and/or visual alarms are provided for all continuous air monitors, room air samplers, area alarms, and liquid monitors. Visual readouts for these alarm systems are located in less contaminated areas to minimize exposure to personnel.
- Areas for decontaminating and maintaining equipment are provided in contaminated areas to limit the spread of contamination to uncontaminated areas such as the control room.
- Instrument interlock systems are provided that automatically return process operations to a safe condition if an unsafe condition should occur.
- The ETF ventilation systems are designed to provide air flow from uncontaminated zones to progressively more contaminated zones.

Protective clothing and equipment are prescribed for personnel handling chemicals or dangerous waste. Whenever possible, exposures to hazards are controlled by accepted engineering and/or administrative controls. Protective gear is used where effective engineering or administrative controls are not feasible.

6.4.6 Prevention of Waste Ignition and Reaction [F-5, F-5a, F-5b]

No ignitable or reactive waste is expected to be handled at the ETF (Chapter 3.0). Therefore, the requirements of WAC 173-303-806(4)(a) are not applicable.

6.4.7 Prevention of Incompatible Waste Mixing [F-5b]

No incompatible waste is expected to be handled at the ETF (Chapter 3.0). Therefore, the requirements of WAC 173-303-806(4)(a) are not applicable.

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Table 6-1. Visual Inspection Schedule for Process Equipment, Piping, Structures, and Areas.
(sheet 1 of 3)

Item	Inspection	Frequency	Inspected by
Main Treatment Train			
Surge tank system	Inspect area for leaks. Note any unusual noises or vibration from the system pumps. Inspect secondary containment system for signs of deterioration.	Daily	Process operator
Rough filter	Inspect module for leaks.	Daily*	Process operator
Ultraviolet oxidation system	Inspect module for leaks. Inspect peroxide storage tank and pumps for leaks.	Daily*	Process operator
pH adjustment tank	Inspect module for leaks.	Daily*	Process operator
H ₂ O ₂ decomposer	Inspect module for leaks.	Daily*	Process operator
Fine filter	Inspect module for leaks.	Daily*	Process operator
Degasification system	Inspect module for leaks. Note any unusual noises or vibration from the degasification blower.	Daily*	Process operator
Reverse osmosis system	Inspect module for leaks. Note any unusual noises or vibration from the system pumps.	Daily*	Process operator
Polishers	Inspect module for leaks. Inspect polishers for proper resin level and mixing.	Daily*	Process operator
Effluent pH adjustment tank	Inspect module for leaks.	Daily*	Process operator

Table 6-1. Visual Inspection Schedule for Process Equipment, Piping, Structures, and Areas.
(sheet 2 of 3)

Item	Inspection	Frequency	Inspected by
1 2 Verification tanks	Inspect area for leaks. Note any unusual noises or vibration from the system pumps. Inspect secondary containment system for signs of deterioration.	Daily	Process operator
3	Secondary Treatment Train		
4 5 Secondary waste receiving tank	Inspect module for leaks.	Daily*	Process operator
6 ETF evaporator	Inspect module for leaks. Note any unusual noises or vibration from the system pumps or compressor.	Daily*	Process operator
7 Concentrate tank	Inspect module for leaks.	Daily*	Process operator
8 Thin film dryer	Inspect module for leaks (viewed through window). Note any unusual noises or vibration from the system pumps or blower.	Daily*	Process operator
9 10 Container handling	Inspect area for spillage.	Daily*	Process operator
11 Resin dewatering	Inspect module for leaks. Note any unusual noises or vibration from the system pumps or blower.	Daily*	Process operator
12	Support Systems		
13 14 Chemical reagent feed system	Inspect 92% H ₂ SO ₄ and 50% NaOH tanks for leaks.	Daily	Process operator
15 Sump tank system	Inspect sump tanks and sump pumps for leaks, spillage, and proper levels.	Daily	Process operator
16 17 18 Vessel ventilation system	Inspect filter housings for leaks. Note any unusual noises from the blowers.	Daily	Process operator

Table 6-1. Visual Inspection Schedule for Process Equipment, Piping, Structures, and Areas.
(sheet 3 of 3)

Item	Inspection	Frequency	Inspected by
Utilities	Inspect demineralized water system for leaks. Inspect compressed air system for leaks or unusual noises. Inspect steam system for leaks.	Daily	Process operator
Disposal System			
Disposal pumps	Inspect disposal pumps for leaks or unusual noises.	Daily*	Process operator
General			
Roads	Inspect all ETF roads for signs of subsidence, bumps, holes, cracks, or other damage. Look for spillage from vehicles.	Monthly	Hanford Facility services and truck drivers
Satellite accumulation areas	Inspect all satellite accumulation areas for container integrity and spill control.	Weekly	Process operator

* Stated inspection frequency to be performed only during ETF operations.

Table 6-2. Visual Inspection Schedule for Safety Equipment.

Item	Inspection	Frequency	Inspected by
Processing Area			
Eye wash stations	Check status; check for adequate pressure.	Weekly	Process operator
Safety showers	Check status; check for adequate pressure.	Weekly	Process operator
General			
Fire extinguishers	Check for adequate charge.	Monthly	Process operator
Emergency lighting	Test operability.	Monthly	Process operator

Table 6-3. Visual Inspection Schedule for Emergency Equipment.

Item	Inspection	Frequency	Inspected by
Processing Area			
Uninterruptible power supply	Check output voltage and visually inspect battery pack for corrosion and leakage. Check indicator lights for fault conditions.	Monthly	Electrician/ process operator

Table 6-4. Inspection Plan for Instrumentation Monitoring. (sheet 1 of 3)

Item	Inspection	Frequency	Inspected by
Main Treatment Train			
Leak detector YE-20B-009	Monitor for leakage in the surge tank drainage sump.	Continuously	Computer Process Operator
Level transmitter LT-60A-012	Monitor surge tank level to prevent overflow.	Continuously	Computer Process Operator
pH analyzer AE-60A-022/023	Monitor surge tank fluid pH to ensure conversion of ammonia to ammonium ion.	Continuously	Computer Process Operator
Radiation analyzer RE-60G-103/203/303	Monitor radiation of effluent from polishers to verification tanks.	Continuously*	Computer Process Operator
Level transmitter LIT-60C-111	Monitor liquid level in pH adjustment tank to prevent overflow.	Continuously*	Computer Process Operator
Level transmitter LIT-60C-211	Monitor liquid level in effluent pH adjustment tank to prevent overflow.	Continuously*	Computer Process Operator
Proportional sampler 60C-224/225	Provide composite sample for effluent quality verification.	Continuously*	Computer Process Operator
Level transmitter LT-60H-001A/B/C	Monitor liquid level in verification tanks to prevent overflow.	Continuously*	Computer Process Operator
Effluent flowmeter TBD	Monitor flow of effluent to the SALDS to prevent flooding of SALDS.	Continuously*	Computer Process Operator
Leak detector YE-20B-010	Monitor for leakage in the verification tank drainage sump.	Continuously	Computer Process Operator
Secondary Treatment Train			
Level transmitter LT-60I-001A/B	Monitor liquid level in secondary waste receiving tanks to prevent overflow.	Continuously*	Computer Process Operator
Level transmitter LT-60J-001A/B	Monitor liquid level in concentrate tanks to prevent overflow.	Continuously*	Computer Process Operator
Level transmitter LT-20B-001	Monitor liquid level in sump No. 1 to prevent overflow.	Continuously*	Computer Process Operator

Table 6-4. Inspection Plan for Instrumentation Monitoring. (sheet 2 of 3)

Item		Inspection	Frequency	Inspected by
1 2	Level transmitter LT-20B-002	Monitor liquid level in sump No. 2 to prevent overflow.	Continuously*	Computer Process Operator
3 4	Leak detector YE-20B-003	Monitor for leakage to sump No. 1.	Continuously*	Computer Process Operator
5 6	Leak detector YE-20B-006	Monitor for leakage to sump No. 2.	Continuously*	Computer Process Operator
7 8	Level transmitter LT-65A-001	Monitor liquid level in boiler feed tank to prevent overflow.	Continuously*	Computer Process Operator
9 10	Level transmitter LT-65A-002	Monitor liquid level in condensate tank to prevent overflow.	Continuously*	Computer Process Operator
11 12	Level transmitter LT-65A-003	Monitor liquid level in dryer boiler to prevent overflow.	Continuously*	Computer Process Operator
13	Support Systems			
14 15	Level transmitter LIT-65C-201	Monitor liquid level in 50% NaOH tank to prevent overflow.	Continuously*	Computer Process Operator
16 17	Level transmitter LIT-65C-211	Monitor liquid level in 4% NaOH tank to prevent overflow.	Continuously*	Computer Process Operator
18 19	Leak detector YE-20B-008	Monitor for leakage to 50% NaOH sump.	Continuously	Computer Process Operator
20 21	Level transmitter LIT-65C-101	Monitor liquid level in 92% H ₂ SO ₄ tank to prevent overflow.	Continuously*	Computer Process Operator
22 23	Level transmitter LIT-65C-111	Monitor liquid level in 4% H ₂ SO ₄ tank to prevent overflow.	Continuously*	Computer Process Operator
24 25	Leak detector YE-20B-007	Monitor for leakage to 92% H ₂ SO ₄ sump.	Continuously	Computer Process Operator
26 27	Cooling water FIT-95C-051	Monitor flow of cooling water effluent to the SALDS to prevent flooding of SALDS.	Continuously*	Computer Process Operator

Table 6-4. Inspection Plan for Instrumentation Monitoring. (sheet 3 of 3)

Item	Inspection	Frequency	Inspected by
Level transmitter LT-95B-001	Monitor liquid level in seal water tank to prevent overflow.	Continuously*	Computer Process Operator

*Stated inspection frequency to be performed only during ETF operations.

TBD = to be determined.

SALDS = State-Approved Land Disposal Site.

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7.0 CONTINGENCY PLAN [G] 7-1

APPENDIX

7A BUILDING EMERGENCY PLAN--200 AREA EFFLUENT TREATMENT
FACILITY APP 7A-1

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7.0 CONTINGENCY PLAN [G]

The WAC 173-303 requirements for contingency plans are satisfied in the following documents: the *Building Emergency Plan--200 Area Effluent Treatment Facility* (Appendix 7A) and the *Hanford Facility Contingency Plan [Hanford Facility Dangerous Waste Permit Application, General Information, Chapter 7.0 (DOE/RL-91-28)]*. Contingency plan documentation is kept at the ETF (Chapter 12.0).

The cited contingency plan documents also serve to satisfy a broad range of other requirements (e.g., Occupational Safety and Health Administration and U.S. Department of Energy Orders). Therefore, revisions made to portions of the contingency plan documents that are not governed by the requirements of WAC 173-303 will not be considered as a modification subject to review or approval by Ecology.

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8.0 PERSONNEL TRAINING [H]

This chapter outlines the training program developed and implemented for employees who have duties associated with dangerous waste management.

The TSD unit training program uses existing training courses. The program is designed to ensure that the ETF (hereinafter referred to as TSD unit) is operated and maintained in accordance with WAC 173-303 requirements.

8.1 OUTLINE OF THE TRAINING PROGRAM [H-1]

The TSD unit training program meets the requirements of WAC 173-303-330 and 40 CFR 264.16 for the development of a written dangerous waste training program.

The TSD unit training program is designed to prepare employees to operate and maintain a TSD unit in a safe, effective, efficient, and environmentally sound manner. In addition to preparing employees to operate and maintain the TSD unit under normal conditions, the training program ensures that employees are prepared to respond in a prompt and effective manner should offnormal or emergency conditions occur. Emergency response training is consistent with emergency responses outlined in the contingency plan (Appendix 7A).

The TSD unit management is responsible for identifying TSD unit- and job-specific training requirements for TSD unit employees. The TSD unit training program includes training courses that cover training requirements for employees who work in the TSD unit. The TSD unit management, in cooperation with other applicable organizations, is responsible for the development and administration of the comprehensive training program for employees assigned to, or involved with, the TSD unit. The TSD unit management is responsible for ensuring that employees complete the appropriate training. The responsibilities of the applicable organizations are discussed in Section 8.1.4.

The TSD unit management will reevaluate the TSD unit training program courses to ensure that dangerous waste training requirements continue to be met. These reevaluations could result in modifying or adding new material to the current training program.

8.1.1 Job Positions and Descriptions [H-1a]

Each employee is assigned a job title (from the salaried nonexempt or bargaining unit classifications) or position (from the exempt classifications). The specific job titles or positions, job or position descriptions, and names of the TSD unit and support organizations employees are maintained by or available from TSD unit management and TSD unit support organization management. The job or position descriptions include applicable desired requisite skills, work experience, education, and other

1 qualifications, and a brief list of duties and/or responsibilities for each
2 job title or position. Training records are maintained by the contractors'
3 organizations in accordance with the requirements of the *Privacy Act of 1974*.
4 Presently, the training records of individual employees are available for
5 inspection purposes through the *Freedom of Information Act of 1966*. The
6 DOE-RL is seeking authorization through the U.S. Department of Energy-
7 Headquarters to amend the systems notice under the *Privacy Act* to allow
8 regulatory agencies 'routine use' access to training records under this act.
9 Training records on current and former employees will be maintained in
10 accordance with Chapter 12.0.

11
12 Brief job titles and position descriptions of employees associated with
13 dangerous waste management at TSD units are listed in the following sections.

14
15 **8.1.1.1 Treatment, Storage, and/or Disposal Unit Manager. Responsibilities**
16 **of TSD unit manager includes the following:**

- 17
18 • Operating and maintaining the TSD unit in compliance with
19 U.S. Department of Energy directives, applicable policies and
20 procedures, and federal and state regulations
- 21
22 • Complying with all dangerous waste policies, procedures, and
23 regulations
- 24
25 • Recruiting and developing a trained cadre of managers, professionals,
26 and nonexempt and bargaining unit employees
- 27
28 • Ensuring safe and disciplined operations by trained personnel who
29 implement policies and procedures
- 30
31 • Providing operational requirements for support organizations to plan
32 and provide services and resources as applicable
- 33
34 • Promoting safe operations at the TSD unit
- 35
36 • Ensuring that TSD unit operating procedures are developed, reviewed,
37 approved, and revised as applicable
- 38
39 • Responding to offnormal and/or emergency conditions according to
40 established procedures
- 41
42 • Serving as the designated alternate to the building emergency director
43 and the staging area manager as applicable
- 44
45 • Performing the duties of the building emergency director, as
46 applicable, for the TSD unit during emergencies.

47
48 **8.1.1.2 Treatment, Storage, and/or Disposal Unit Operations Management.**
49 **Responsibilities of the TSD unit operations management include the following:**

- 50
51 • Supervising, coordinating, and directing the activities of TSD unit
52 operations supervisors

- 1 • Promoting safe operations at the TSD unit
- 2
- 3 • Enforcing safety, housekeeping, and general operating rules
- 4
- 5 • Maintaining control over TSD unit operations in accordance with
- 6 established operating procedures and policies, U.S. Department of
- 7 Energy Orders, and federal and state regulations
- 8
- 9 • Directing, controlling, and coordinating the receipt, storage,
- 10 transfer, and reprocessing of dangerous waste
- 11
- 12 • Ensuring TSD unit operations are conducted according to established
- 13 procedures
- 14
- 15 • Ensuring compliance with TSD unit operating limits and specifications
- 16
- 17 • Ensuring that job safety and planning meetings are conducted, as
- 18 applicable, with personnel involved with the TSD unit operations
- 19
- 20 • Ensuring that supervisors and nuclear operators are trained
- 21
- 22 • Ensuring that dangerous waste exposure is maintained ALARA
- 23
- 24 • Ensuring that essential records are maintained
- 25
- 26 • Determining the status of and resolving action items arising from
- 27 audits, inspections, and unusual occurrences
- 28
- 29 • Developing, revising, and reviewing TSD unit operating procedures as
- 30 applicable
- 31
- 32 • Responding to and providing remedial guidance and decisions for
- 33 operational anomalies, offnormal conditions, and equipment
- 34 malfunctions
- 35
- 36 • Responding to offnormal and/or emergency conditions according to
- 37 established procedures
- 38
- 39 • Coordinating the recovery from, and measuring and reestablishing
- 40 control of, unplanned releases to the environment and other emergency
- 41 conditions
- 42
- 43 • Notifying TSD unit management of any unplanned releases to the
- 44 environment
- 45
- 46 • Serving as the designated alternate to the building emergency director
- 47 and the staging area manager as applicable
- 48
- 49 • Performing the duties of the building emergency director, as
- 50 applicable, for the TSD unit during emergencies.
- 51

1 **8.1.1.3 Treatment, Storage, and/or Disposal Unit Operations Supervisors.**

2 Responsibilities of the TSD unit operations supervisors include the following:

- 3
- 4 • Supervising, coordinating, and directing the activities of the nuclear
- 5 operators
- 6
- 7 • Promoting safe operation at the TSD unit
- 8
- 9 • Enforcing safety, housekeeping, and general operating rules
- 10
- 11 • Ensuring that TSD unit operations are in accordance with established
- 12 operating procedures and policies, U.S. Department of Energy Orders,
- 13 and federal and state regulations
- 14
- 15 • Supervising and coordinating the receipt, storage, transfer, and
- 16 reprocessing of dangerous waste
- 17
- 18 • Conducting TSD unit operations according to established procedures
- 19
- 20 • Ensuring compliance with TSD unit operating limits and specifications
- 21
- 22 • Conducting pre-job safety and planning meetings with personnel
- 23 involved with TSD unit operations as applicable
- 24
- 25 • Training and/or arranging training for nuclear operators
- 26
- 27 • Ensuring that dangerous waste exposure is maintained ALARA
- 28
- 29 • Minimizing injuries and/or equipment damage
- 30
- 31 • Maintaining essential records
- 32
- 33 • Revising and reviewing TSD unit operating procedures as applicable
- 34
- 35 • Recognizing offnormal conditions and taking appropriate action
- 36
- 37 • Responding to offnormal and/or emergency conditions according to
- 38 established procedures
- 39
- 40 • Notifying TSD unit management of any unplanned releases to the
- 41 environment
- 42
- 43 • Serving as designated alternate to the building emergency director and
- 44 the staging area manager as applicable
- 45
- 46 • Performing the duties of the building emergency director, as
- 47 applicable, for the TSD unit during emergencies.
- 48

8.1.1.4 Treatment, Storage, and/or Disposal Unit Nuclear Operators.
Responsibilities of the TSD unit nuclear operators include the following:

- Performing TSD unit work activities in accordance with current operating procedures
- Attending TSD unit operations work plan and pre-job safety meetings
- Escorting supporting crafts and visitors entering the TSD unit as applicable
- Reporting recommended changes to the TSD unit operating procedures to immediate supervisor
- Receiving, segregating, sorting, inventorying, storing, staging, and shipping dangerous waste
- Packaging and labeling dangerous waste for shipment
- Operating processes, systems, and equipment at the TSD unit
- Performing sampling as required by procedure
- Conducting routine inspections
- Providing surveillance of the TSD unit for offnormal conditions
- Performing nondestructive assaying activities at the TSD unit as applicable
- Assisting truck drivers in loading and unloading trucks at the TSD unit
- Ensuring that trucks transporting dangerous waste are placarded properly
- Responding to alarms at the TSD unit
- Responding to offnormal and/or emergency conditions according to established procedures
- Responding to dangerous waste leaks or spills .

8.1.1.5 Treatment, Storage, and/or Disposal Unit Engineering Managers and Engineers. Responsibilities of the TSD unit engineering managers and engineers include the following:

- Providing the TSD unit with equipment, buildings, and structures that can be operated safely and productively
- Recruiting, training, qualifying, appraising, and developing a highly competent and professional engineering staff

- 1 • Ensuring that the staff is knowledgeable of procedures, equipment,
2 buildings, and processes so that the staff can identify problem areas
3 and provide remedial action in a timely fashion to keep the TSD unit
4 operating safely and productively
5
- 6 • Overseeing and directing the activities of the cognizant/process
7 engineering staff so that the TSD unit can be operated in a safe,
8 efficient, and technically sound manner
9
- 10 • Ensuring that the TSD unit emergency and monitoring equipment, process
11 equipment, procedures, designs, etc., comply with U.S. Department of
12 Energy Orders, federal and state regulations, national standards, and
13 applicable engineering procedures and management standards
14
- 15 • Issuing and maintaining or providing oversight and review of TSD unit
16 operating documentation, operating procedures, flowsheets, sample
17 schedules, specifications, process test plans and procedures,
18 operational safety requirements, and other documents necessary to
19 operate the TSD unit
20
- 21 • Performing routine and comprehensive evaluations of the TSD unit
22 processes to ensure compliance with process control requirements,
23 procedure compliance, and equipment performance; assessing problem
24 areas and implementing timely corrective actions
25
- 26 • Preparing, issuing, and reviewing TSD unit operating procedures, and
27 preparing and issuing procedure departure authorizations
28
- 29 • Performing daily, routine, and comprehensive evaluations of TSD unit
30 process parameters to ensure compliance with procedures
31
- 32 • Maintaining TSD unit instrument and equipment flow diagrams
33
- 34 • Preparing design criteria, and performing and approving design
35 analysis
36
- 37 • Preparing and approving equipment and material specifications for new
38 design
39
- 40 • Preparing and approving engineering design documents and drawings that
41 are in compliance with applicable policies, procedures, and
42 instructions and are in accordance with recognized national standards
43 and codes
44
- 45 • Providing input to environmental permit applications
46
- 47 • Preparing and/or approving engineering change notices
48
- 49 • Preparing and approving TSD unit process memos, process test plans,
50 and work plans
51

- Reviewing and approving TSD unit work authorizations and assigning impact levels
- Providing technical direction for hazardous material and dangerous waste spill responses
- Responding to offnormal and/or emergency conditions according to established procedures.

8.1.1.6 Treatment, Storage, and/or Disposal Unit Maintenance Managers and Engineers. Responsibilities of the TSD unit maintenance managers and engineers include the following:

- Supervising, coordinating, and directing the activities of the maintenance supervisors
- Inspecting and replacing emergency and monitoring equipment
- Ensuring compliance with requirements, applicable policies, programs, regulations, and U.S. Department of Energy Orders to ensure employee safety, environmental compliance, and public safety
- Assisting in the detailed planning of schedules and budgets to ensure that work is performed in accordance with established schedules and within budgets
- Evaluating and modifying maintenance procedures and work plans, and ensuring that procedures are current and accurate
- Ensuring that requirements are identified for each assigned TSD unit, giving particular attention to items supporting safety systems
- Identifying preventive maintenance requirements and deficiencies
- Conducting equipment and TSD unit walkdowns and providing recommendations for reliability improvements
- Providing for continued input and development of the equipment history file in support of trend analysis reviews and specific problem resolution
- Conducting critical equipment failure analysis with the cognizant system engineer
- Promoting safe maintenance practices at the TSD unit
- Ensuring that maintenance activities are conducted in accordance with procedures
- Ensuring that supervisors and crafts are trained

- Ensuring pre-job safety and planning meetings are conducted with personnel involved with the TSD unit
- Ensuring that dangerous waste exposure is maintained ALARA
- Responding to offnormal and/or emergency conditions according to established procedures.

8.1.1.7 Treatment, Storage, and/or Disposal Unit Maintenance Supervisors.
Responsibilities of the TSD unit maintenance supervisors include the following:

- Supervising, coordinating, and directing the activities of maintenance crafts
- Promoting safe maintenance practices at the TSD unit
- Enforcing safety, housekeeping, and general operating rules
- Conducting maintenance activities according to established procedures
- Training and/or arranging training for personnel
- Ensuring that maintenance crafts are trained
- Maintaining essential records
- Conducting pre-job safety and planning meetings with personnel involved with the TSD unit
- Minimizing injuries and/or equipment damage
- Ensuring that dangerous waste exposure is maintained ALARA
- Identifying offnormal conditions and taking appropriate action
- Responding to offnormal and/or emergency conditions according to established procedures.

8.1.1.8 Treatment, Storage, and/or Disposal Unit Maintenance Crafts.
Responsibilities of the TSD unit maintenance crafts include the following:

- Providing routine scheduled and emergency maintenance services
- Providing dedicated scheduled and emergency state-of-the-art equipment and/or systems services
- Verifying and monitoring that instrumentation and equipment are functioning properly

- Inspecting, repairing, and replacing emergency and monitoring equipment
- Responding to offnormal and/or emergency conditions according to established procedures.

8.1.1.9 Treatment, Storage, and/or Disposal Unit Environmental Compliance Manager or Officer. Responsibilities of the TSD unit environmental compliance manager or officer include the following:

- Overviewing TSD unit environmental issues
- Assessing dangerous waste handling problem areas and implementing timely actions
- Ensuring that TSD unit management is in compliance with dangerous waste regulations
- Ensuring adherence to the EPA and Ecology reporting requirements
- Serving as the single point of contact for environmental and dangerous waste related matters
- Managing TSD unit environmental and dangerous waste program corrective actions status to achieve compliance with dangerous waste permits
- Coordinating the review and submittal of environmental data for the following:
 - Annual dangerous waste report
 - Waste minimization report
 - Waste volume projections (solid and liquid)
 - *Superfund Amendments and Reauthorization Act (SARA) of 1986* 312 Inventory
 - SARA 313 releases
 - EPA surveys
- Preparing and providing input for reporting the following:
 - Spill information
 - Interim status compliance
 - Ecology and EPA reporting requirements
- Ensuring the development and review of new or revised permit applications including the following:
 - Part A notifications
 - Part B permit applications
 - Closure plan applications
 - Clean air permit applications
 - National Pollution Discharge Elimination System permit applications and well registrations
- Ensuring implementation of permitting requirements and conducting periodic surveillances of compliance assessment with permits

- 1 • Ensuring the maintenance of active permits in an up-to-date condition
- 2
- 3 • Resolving regulatory interpretations required to operate TSD unit
- 4 through interfacing with the applicable environmental organizations,
- 5 DOE-RL, Ecology, EPA, and applicable health departments
- 6
- 7 • Preparing, issuing, reviewing, and approving dangerous waste handling
- 8 procedures as applicable
- 9
- 10 • Determining and issuing dangerous waste handling, packaging, and
- 11 shipping requirements as applicable
- 12
- 13 • Assessing dangerous waste handling problem areas and implementing
- 14 corrective action(s)
- 15
- 16 • Approving dangerous waste container control as applicable
- 17
- 18 • Ensuring that a tracking system for dangerous waste is maintained.
- 19

20 **8.1.1.10 Treatment, Storage, and/or Disposal Unit Support Organizations**
21 **Management and Technical Support Personnel.** The TSD support organizations
22 management and technical support personnel provide support as applicable to
23 assist TSD unit management to operate and maintain the TSD unit in a safe,
24 effective, efficient, and environmentally acceptable manner. This operation
25 is in accordance with applicable dangerous waste management procedures,
26 U.S. Department of Energy directives, applicable management policies, and
27 federal and state regulations. The TSD unit management will provide a list of
28 TSD unit support organizations when requested to do so by regulators on a
29 demonstrated need-to-know basis. In addition, the TSD unit support
30 organizations management will provide through RCRA Compliance support the
31 applicable job titles and support responsibilities when requested to do so by
32 the regulators. Responsibilities of the TSD unit support organizations
33 management and technical support personnel include, but are not limited to,
34 the following functions:

- 35
- 36 • Engineering
- 37 • Maintenance
- 38 • Transportation
- 39 • Safety
- 40 • Health physics
- 41 • Training
- 42 • Nondestructive examinations
- 43 • Oversight
- 44 • Overviews
- 45 • Inspections
- 46 • Surveillances
- 47 • Surveys
- 48 • Appraisals
- 49 • Audits
- 50 • Laboratory analysis
- 51 • Environmental issues
- 52 • Security

- Fire protection
- Emergency medical services
- Dangerous waste accidents.

8.1.2 Employees Dangerous Waste Work Category Classifications

The TSD unit employees, including TSD unit support organizations employees, are classified into one of four categories with respect to their job titles, positions, and responsibilities or their involvement with dangerous waste management. This classification is determined by the employees manager using the Decision Flow Diagram in Figure 8-1.

The four categories of workers are as follows:

- All employees
- General worker
- General supervisor/manager
- General nonradiological shipper.

8.1.3 Training Content, Frequency, and Techniques [H-1b]

This section provides an overview of dangerous waste management, unit-specific, and job-specific training provided to employees in job titles and positions discussed in the previous sections. In addition to TSD unit normal operating conditions, employees are trained on emergency equipment and systems, and emergency procedures to include the following:

- Procedures for using, inspecting, repairing, and replacing TSD unit emergency and monitoring equipment
- Automatic or manual dangerous waste feed cut-off systems
- Communications and alarm systems
- Response to fires and explosions
- Response to dangerous waste contamination incidents and spills
- Shutdown of operation.

8.1.3.1 Overview of Training for Specific Employee Categories. The training program uses existing courses that includes general to specific dangerous waste training material. The courses are given through classroom instruction, on-the-job training, and self-study. The training requirements depend on the category in which the TSD unit employees, including TSD unit support organizations employees, are classified by management. The work category initial and continuing training program course requirements are listed in Tables 8-1 and 8-2.

1 **8.1.3.2 Overview of Training for Treatment, Storage, and/or Disposal**
2 **Unit-Specific and Job-Specific Positions.** The TSD unit employees receive
3 applicable unit-specific and job-specific training. The TSD unit-specific and
4 job-specific qualifications and/or certifications are maintained according to
5 union bargaining unit contracts and/or management policies or directions. The
6 courses are given through classroom instruction, on-the-job training,
7 self-study, and computer-based training. The TSD unit management and
8 employees complete specific courses in preparation for work assignments,
9 including hazardous material and dangerous waste training courses. The
10 courses address the TSD unit management procedures, U.S. Department of Energy
11 directives, applicable management policies, and federal and state regulations.
12 The courses include implementation of the TSD unit contingency plan and use of
13 emergency and monitoring equipment. The TSD unit designated management and
14 employees are required to be qualified and/or certified for assigned jobs
15 through a performance-based training process as determined by management. The
16 TSD unit-specific and job-specific initial and continuing training program
17 course requirements are listed in Tables 8-3 and 8-4.

18
19 **8.1.3.3 Treatment, Storage, and/or Disposal Unit Support Organizations**
20 **Management and Technical Support Personnel Training.** The TSD unit support
21 organizations employees might be required to complete selected
22 TSD unit-specific and job-specific training courses as applicable to their
23 involvement with dangerous waste management (refer to Tables 8-3 and 8-4 for
24 initial and continuing training courses). The TSD unit support organizations
25 management is responsible for determining employees job position training
26 requirements and for ensuring that management and employees are trained.

27
28 **8.1.3.4 Visitor Training.** Visitors who must enter the TSD unit are required
29 to complete the following training and/or must be escorted as applicable:

- 30
31 • Dangerous waste management courses according to their job assignments
32 (Figure 8-1)
- 33
34 • TSD unit orientation
- 35
36 • General employee safety orientation
- 37
38 • Building emergency plan orientation.
- 39

40 The TSD unit management is responsible for determining visitor training
41 and medical surveillance requirements before granting visitor access to the
42 TSD unit. The TSD unit management is responsible for ensuring that the
43 visitors have met all the requirements for access to the TSD unit (refer to
44 Tables 8-1, 8-2, and 8-3 as applicable).

45
46 **8.1.3.5 Subcontractor Training.** Subcontractor personnel at the TSD unit must
47 complete the appropriate level of training determined by employment, security,
48 and TSD unit management. Refer to Section 8.1.3.4 for the training
49 requirements. Additional general training could be required when applicable.

50
51 Subcontractor personnel who have completed training offsite are required
52 to provide a certificate or other suitable evidence of training course(s) that

1 meet the requirements of WAC 173-303 and this section. The TSD unit
2 management must verify the acceptability of offsite training as commensurate
3 with subcontractor personnel's anticipated TSD unit job assignment and the
4 minimum training requirements listed in Section 8.1.3.4.
5

6 **8.1.3.6 Training Matrix: Job Positions and Training.** The TSD unit
7 management applicable dangerous waste training program encompasses general,
8 unit-specific, and job-specific training courses. Tables 8-1 through 8-4
9 consist of matrices that relate work categories and job titles or positions to
10 the training courses applicable to the TSD unit. The matrices indicate if the
11 course is initial, introductory or continuing and also if the course is a part
12 of a qualification or certification program required for specific job titles
13 or positions or required only for new employees.
14

15 A computerized mandatory training matrix for all employees has been
16 developed and interfaces with the training records information system. The
17 mandatory training matrix lists all training requirements for all individual
18 employees and for each individual organization. The TSD unit management and
19 support organizations are responsible for ensuring that the mandatory training
20 matrix for their organization is updated when required and/or as changes
21 occur. The mandatory training matrix provides real-time training requirement
22 for each employee and records when training is complete and when retraining is
23 due.
24

25 Some courses are initial or introductory and must be completed once only
26 (often referred to as orientation), and other initial or introductory courses
27 are the first course in a program. Continuing courses are those that must be
28 repeated according to a specified frequency.
29

30 **8.1.3.7 Training Course Descriptions.** Appendix 8A contains a brief
31 description of the existing training courses selected for this program,
32 including course title, course description, target audience, instructional
33 delivery, evaluation method, length of course, and frequency of retraining.
34

35 36 **8.1.4 Training Director [H-1c]** 37

38 There is no one individual designated as training director. The position
39 is shared among the TSD unit management, training, and support organizations.
40 The distribution of training responsibilities is provided in Figure 8-2.
41 Using the system noted in Figure 8-2, the TSD unit management can access
42 training resources and experts on many different areas of hazardous material,
43 dangerous waste management, and safety rather than relying on the knowledge of
44 one person or a small number of individuals. This shared responsibility
45 ensures the identification of training requirements and that the development
46 and implementation of the dangerous waste management training program for the
47 TSD units comply with U.S. Department of Energy directives, management
48 policies, federal hazardous waste regulations, and WAC 173-303. The TSD unit
49 management can provide through RCRA Compliance support the current list of
50 organizations sharing training responsibilities when requested to do so by the
51 regulators. General responsibilities for training are discussed in the
52 following sections.

1 **8.1.4.1 Treatment, Storage, and/or Disposal Unit Management Responsibilities.**
2 The TSD unit management has the following responsibilities related to
3 training:

- 4 • Determining training requirements and training compliance
- 5 • Requesting and/or conducting training
- 6 • Maintaining field training records and certifications
- 7 • Submitting training completion records to the training records
- 8 information system
- 9 • Reporting training requirements for employees to the training records
- 10 information system for updating the mandatory training matrix as
- 11 required
- 12 • Tracking retraining requirements.

13
14 **8.1.4.2 Treatment, Storage, and/or Disposal Unit Engineering**
15 **Responsibilities.** Treatment, storage, and/or disposal unit engineering has
16 the following responsibilities related to training:

- 17 • Determining engineering training requirements
- 18 • Developing and conducting training
- 19 • Maintaining field training records and certifications
- 20 • Submitting training completion records to the training records
- 21 information system
- 22 • Reporting training requirements for engineers to the training records
- 23 information system for updating the mandatory training matrix as
- 24 required
- 25 • Tracking retraining requirements.

26
27 **8.1.4.3 Training Organizations Responsibilities.** Training organizations have
28 the following responsibilities:

- 29 • Conducting job analysis
- 30 • Designing training programs
- 31 • Developing training programs
- 32 • Developing training courses
- 33 • Providing training program accreditation assistance

- 1 • Providing consultation to other training organizations regarding
- 2 training development
- 3
- 4 • Developing and implementing safety training courses to comply with
- 5 federal and state regulations
- 6
- 7 • Conducting safety training courses
- 8
- 9 • Conducting respiratory protection classes
- 10
- 11 • Determining personnel training requirements
- 12
- 13 • Developing and providing certification training
- 14
- 15 • Determining dangerous waste management training requirements
- 16
- 17 • Developing and implementing environmental training courses to comply
- 18 with U.S. Department of Energy directives and federal and state
- 19 dangerous waste regulations
- 20
- 21 • Conducting hazardous material and dangerous waste handling and
- 22 management courses
- 23
- 24 • Developing unit and specific training courses for the TSD unit
- 25 management operations employees
- 26
- 27 • Developing and maintaining on-the-job training requirements
- 28
- 29 • Providing instruction for selected courses
- 30
- 31 • Developing and providing study material and examinations
- 32
- 33 • Preparing and administering examinations
- 34
- 35 • Developing and conducting on-the-job training
- 36
- 37 • Coordinating classes and other training requirements to complete and
- 38 maintain certifications
- 39
- 40 • Tracking retraining requirements as required
- 41
- 42 • Operating and maintaining central training record files
- 43
- 44 • Maintaining the training records information system
- 45
- 46 • Maintaining the mandatory training matrix for all employees and
- 47 organizations
- 48
- 49 • Processing training completion records received into the training
- 50 records information system
- 51
- 52 • Notifying management of retraining requirements for employees.

1 **8.1.4.4 Support Organizations Management Responsibilities.** Support
2 organizations management has the following responsibilities related to
3 training:

- 4
- 5 • Consulting with training organizations and the TSD unit management in
6 the development and reevaluation of current training programs
- 7
- 8 • Determining training requirements and training compliance for
9 employees
- 10
- 11 • Maintaining current knowledge of training requirements for employees
- 12
- 13 • Requesting and/or conducting training for employees
- 14
- 15 • Maintaining field training records and qualifications or
16 certifications
- 17
- 18 • Providing training for selected courses for employees
- 19
- 20 • Submitting training completion records to training records information
21 system as applicable
- 22
- 23 • Reporting training requirements for employees to the training records
24 information system for updating the mandatory training matrix as
25 applicable
- 26
- 27 • Tracking retraining requirements as required.
- 28
- 29

30 **8.1.5 Relevance of Training to Job Positions [H-1d]**

31
32 The training program for the TSD unit management employees was developed
33 after reviewing U.S. Department of Energy directives, federal and state
34 regulations, and the completion of a job analysis for management-selected job
35 positions. Tasks performed by employees in selected job positions were
36 identified and evaluated to determine training requirements. In addition,
37 training needs are evaluated continually in relation to current
38 U.S. Department of Energy directives and federal and state regulations.
39 These evaluations could result in modifying or adding new material to the
40 current training program.

41
42 Certification is required for employees working in TSD units in selected
43 job positions. To become certified, an employee must successfully complete
44 classroom training, self-study, and on-the-job training as applicable.
45 Classroom instruction and/or self-study is designed to provide selected
46 employees with the fundamental knowledge required to work safely at the
47 TSD unit.

48
49 On-the-job training requires selected employees of the TSD unit to gain
50 experience with the operating procedures. All work involving hazardous
51 materials and dangerous waste management is performed according to approved
52 operating procedures; therefore, an understanding of procedures is crucial to

1 ensure the proper and safe operation of the TSD unit. Employees learn the
2 procedures by performing, simulating, and/or describing a particular task as
3 specified by the appropriate operating procedure. The employee demonstrating
4 the required knowledge and skills is observed by another certified employee
5 and the supervisor or manager before being certified.

6
7 The TSD unit management training program outlined here ensures that
8 employees are trained properly to perform the job positions pertinent to the
9 handling, storage, treatment, and/or disposal of dangerous waste.

10
11 The TSD unit employees and support organization employees also could and
12 do receive additional training in accordance with other regulations such as
13 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" and
14 29 CFR 1910.1200, "Hazard Communication Program," and the U.S. Department of
15 Energy directives and management policies.

16 17 18 8.1.6 Training to Emergency Response [H-1e] 19

20 Effective response to emergencies and familiarity with emergency
21 equipment and emergency systems are covered under the classroom and on-the-job
22 training requirements outlined in Tables 8-3 and 8-4, and Appendix 8A.

23
24 Federal and state regulations require that employees be able to respond
25 effectively to emergencies and that employees be familiar with emergency
26 procedures, emergency equipment, and emergency systems. Specific topics
27 required by federal and state dangerous waste regulations listed in
28 Section 8.1.3 are addressed where applicable and are included in the following
29 training:

- 30
- 31 • Building emergency director training
- 32 • Building emergency plan checklist training (all employees)
- 33 • Emergency procedure and abnormal conditions training
- 34 • Treatment, storage, and/or disposal unit-specific training
- 35 • Treatment, storage, and/or disposal job-specific training.
- 36

37 38 8.2 IMPLEMENTATION OF TRAINING PROGRAM [H-2] 39

40 The TSD unit management training program is in place. Certification for
41 designated employees of the TSD unit is required before working without
42 supervision. Training content is reviewed and updated as applicable.

43
44 Training of new employees is completed within the first 6 months of
45 assignment to the TSD unit. After the initial training, employees are
46 required to recertify annually or biennially as applicable. Uncertified
47 employees are not permitted to work at the TSD unit without supervision of a
48 certified employee. The TSD unit operations management is responsible for
49 ensuring that all designated employees are trained and that certifications are
50 maintained.

1 Official training record files for the TSD unit management employees are
2 stored in the training records information system. This database is managed
3 by the training records organization. The training records organization
4 inputs the completed training records into a computer file. The computer file
5 is accessible on a local area network to allow remote accessing of employee
6 training records by means of a computer terminal. A tickler file is available
7 from the database to inform the TSD unit operations management when training
8 is within 90 days of expiration. A computerized copy of completed training
9 and qualifications or certifications for the TSD unit management employees is
10 available at the TSD unit. These files include employee training records,
11 course attendance rosters, and course outlines. Training records are
12 maintained by the contractors' organizations in accordance with the
13 requirements of the *Privacy Act of 1974*. Presently, the training records of
14 individual employees are available for inspection purposes through the *Freedom*
15 *of Information Act of 1966*. The DOE-RL is seeking authorization through the
16 DOE-Headquarters to amend the systems notice under the *Privacy Act of 1974* to
17 allow regulatory agencies 'routine use' access to training records under this
18 act. Training records on current and former employees will be maintained in
19 accordance with Chapter 12.0.

Figure 8-1. Employee Work Category Decision Flow Diagram.

Figure 8-2. Distribution of Training Responsibility for Treatment, Storage, and/or Disposal Units.

Table 8-1. Dangerous Waste Initial Training Requirements Matrix.

Employee category ^a	Course title			
	Hazardous communications and waste orientation (1 hour)	Generator hazardous safety training (4 hours)	Facility emergency and hazard information checklist training (4-6 hours)	Hazardous waste shipment certification (24 hours)
1. All employees	X ^b			
2. General worker		X ^b	X	
3. General supervisor/manager		X	X	
4. General nonradiological shipper		X	X	X

^aCategory definitions are in Figure 8-1.

^bRequired for visitors and subcontractors as determined by the TSD unit management.

X = required.

Table 8-2. Dangerous Waste Continuing Training Requirements Matrix.

Employee category ^a	Course title		
	Generator hazards safety training (4 hours/2 years)	Facility emergency and hazard information checklist training (4-6 hours/1 year)	Hazardous waste shipment certification (24 hours/1 year)
1. All employees	(none required)		
2. General worker	X ^b	X	
3. General supervisor/manager	X	X	
4. General nonradiological shipper	X	X	X

^aCategory definitions are in Figure 8-1.

^bRequired for visitors and subcontractors as determined by the TSD unit management.

X = required.

Table 8-3. Treatment, Storage, and/or Disposal Unit-Specific Training Matrix.

Job positions	Course Title				
	General employee training (2 years)	New employee safety training (Initial)	Building emergency director training (1 year)	Building emergency plan checklist training (1 year)	TSD unit orientation (Initial/1 year/2 years)
TSD unit manager	X	X ^b	X	X	X
TSD unit operations management ^a	X	X ^b	X	X	X
TSD unit operations supervisors	X	X ^b	X	X	X
TSD unit nuclear operators	X	X ^b		X	X
TSD unit engineering managers and engineers	X	X ^b		X	X
TSD unit maintenance managers and engineers	X	X ^b		X	X
TSD unit maintenance supervisors	X	X ^b		X	X
TSD unit maintenance crafts	X	X ^b		X	X
TSD unit environmental compliance manager or officer	X	X ^b		X	X
TSD unit support organizations management and technical support personnel	X	X ^b		X	X
Visitors	X ^c			X ^c	X ^c
Subcontractors	X ^c			X ^c	X ^c

^aIncludes job titles (such as, operations manager, shift operations manager, facility operations manager, building operations manager, shift manager, shift surveillance manager, surveillance manager).

^bRequired for new employees.

^cRequired as determined by the TSD unit management.

X = required.

Table 8-4. Treatment, Storage, and/or Disposal Job-Specific Training Matrix.

Job positions	Course Title									
	TSD unit-specific training (2 years)	TSD unit nuclear operator certificate (2 years)	TSD unit nuclear operator emergency procedures and abnormal condition training (1 year)	TSD unit supervisor/manager certification (2 years)	TSD unit supervisor/manager emergency procedure and abnormal conditions training (1 year)	TSD unit phase I process engineer certification (site-generic training) (initial)	TSD unit phase II process engineer certification (unit-specific training) (2 years)	TSD unit phase III process engineer certification (process-specific training) (2 years)	TSD unit process engineer emergency process and abnormal condition training (1 year)	TSD unit emergency process and abnormal condition training (1 year)
TSD unit operations management ^a	x ^b	x ^b		x ^b	x ^b					
TSD unit operations supervisors	x ^b	x ^b		x	x					
TSD unit nuclear operators	x	x	x							
TSD unit engineering managers and engineers						x ^c	x ^c	x ^c	x ^c	
TSD unit maintenance managers and engineers										x ^d
TSD unit maintenance supervisors										x ^d
TSD unit maintenance crafts										x ^d
TSD unit support organizations management and technical support personnel										x ^d

^aIncludes job titles such as, operations manager, shift operations manager, facility operations manager, building operations manager, shift manager, shift surveillance manager, surveillance manager.

^bRequired as determined by the TSD unit management for designated job positions.

^cNot all phases training required at each the TSD unit. Required phases and emergency procedure and abnormal conditions training as determined by the TSD unit management for designated job positions.

^dRequired as determined by immediate management and the TSD unit management.

X = Required.

CONTENTS

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9.0 EXPOSURE INFORMATION REPORT 9-1

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9.0 EXPOSURE INFORMATION REPORT

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The ETF does not store, treat, or dispose of hazardous waste in a surface impoundment or a landfill as defined in 40 CFR 270.10 and RCRA, Section 3019. Therefore, exposure information is not required.

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10.0 WASTE MINIMIZATION 10-1

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10.0 WASTE MINIMIZATION

Requirements relevant to waste minimization are contained in 40 CFR 264.73(a) and 264.73(b)(9). The requirements of 40 CFR.264.73(a) state that the "owner or operator must keep a written operating record at his facility." The requirements of 264.73(b)(9) mandate the following:

"a certification by the permittee no less often than annually, that the permittee has a program in place to reduce the volume and toxicity of hazardous waste that he generates to the degree determined by the permittee to be economically practicable; and the proposed method of treatment, storage or disposal is that practicable method currently available to the permittee which minimizes the present and future threat to human health and the environment."

To fulfill the requirements of 264.73(b)(9), a certification that the ETF has a waste minimization program in place will be entered, annually, into the ETF operating record (Chapter 12.0).

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FIGURE

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11-1. Typical Closure Certification Document F11-1

11.0 CLOSURE AND POSTCLOSURE REQUIREMENTS [I]

This chapter describes the planned activities and performance standards for closing the ETF. No postclosure activities are applicable or required for the closure because the ETF will be clean closed. Clean closure requires that all dangerous waste be removed and disposed of in accordance with applicable regulations. The ETF is in the process of final design and, therefore, this closure plan should be considered conceptual. Current regulations and laws will be reviewed periodically and the closure plan modified as necessary. The intent is to clean close the ETF. However, if it is determined that clean closure is not possible or is environmentally impractical, the closure plan will be modified to address required postclosure activities.

11.1 CLOSURE PLAN [I-1]

As currently envisioned, closure activities will be conducted in two phases as follows.

- Phase 1 will consist of the decontamination or removal of all waste piping and equipment between the LERF and the 242-A Evaporator and the ETF. All waste piping and equipment will be transported to an appropriate disposal unit.
- Phase 2 will consist of the removal or decontamination of all contaminated equipment and structures within the ETF. Equipment and structures will be transported to an appropriate disposal unit.

11.1.1 Closure Performance Standard [I-1a]

These sections describe the performance and removal or decontamination standards to be applied to the ETF.

11.1.1.1 Performance Standard [I-1a(1)]. This plan has been developed to close the ETF in a manner that meets the following closure performance standards of WAC 173-303-610(2)(a):

- Minimizes the need for future maintenance
- Controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, postclosure escape of dangerous waste, dangerous waste constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, ground water, or the atmosphere
- Returns the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activities.

1 In addition, all equipment structures, and other material associated with
2 closure of the ETF also will be decontaminated or removed in accordance with
3 WAC 173-303-610(2)(a).
4

5 The ETF is designed for a 30-year operational life with projected closure
6 anticipated for the year 2024. Current regulations and laws will be reviewed
7 periodically and the closure plan modified as necessary. If it is determined
8 that clean closure is not possible or is environmentally impractical, the
9 closure plan will be modified to address required postclosure activities.
10

11 Clean closure of the ETF will eliminate the need for postclosure
12 maintenance. To aid in the determination of any soil and groundwater
13 contamination from ETF operations, verification soil sampling will be
14 conducted at the end of closure operations to confirm that no soil
15 contamination exists.
16

17 11.1.1.2 Removal or Decontamination Standard [I-1a(2)]. Clean closure of the
18 ETF will consist of the removal and disposal of dangerous waste and the
19 decontamination and/or removal and disposal of contaminated equipment. The
20 ETF was designed to incorporate removable components to facilitate closure by
21 allowing removal, if necessary, of equipment contaminated with dangerous
22 waste. All structures determined to be contaminated will be scoured by
23 sandblasting, steam cleaning, or other appropriate technologies required to
24 effectively clean the surfaces. The leachate, rinsate, or residues from
25 decontamination also will be collected as a potential dangerous waste.
26 A sampling and analysis program will be developed to verify that no
27 contaminant proven to be above health-based standards remains in any
28 structures or soils around the ETF as specified in WAC 173-303-610(2).
29

30 The decontamination and/or removal and disposal of all structures and
31 equipment are addressed in Section 11.1.4.
32
33

34 11.1.2 Partial Closure Activities [I-1b]

35

36 No partial closure activity is anticipated for the ETF.
37
38

39 11.1.3 Maximum Waste Inventory [I-1c]

40

41 Based on current design specifications, the maximum waste inventory at
42 the ETF at any one time should be approximately 2.08 million gallons
43 (7.87 million liters). This represents an upper-limit volume based on:
44 (1) a summation of the total volumes for the surge tank at the beginning of
45 the waste stream at 100,000 gallons (380,000 liters); (2) the summation of the
46 volume of the waste in the waste stream within the ETF at 25,000 gallons
47 (95,000 liters); (3) the summation of the three verification tanks at
48 1,950,000 gallons (7,382,000 liters), and (4) the volume of containers in the
49 filled container storage area at 60,000 gallons (227,000 liters). This
50 includes the volumes in tanks containing process chemicals, which could
51 potentially become dangerous waste if not completely used in the process
52 before closure of the ETF.

1 11.1.4 Inventory Removal, Disposal, or Decontamination
2 of Equipment, Structures, and Soils [I-1d]
3

4 Closure of the ETF will consist of removal of all waste and
5 decontamination and disposal of all structures and equipment. The ETF will be
6 closed in a manner that protects human health and the environment, and that
7 minimizes or eliminates the escape of waste constituents to the ground, to
8 surface waters, or to the atmosphere.
9

10 The ETF closure plan will provide for the following:
11

- 12 • Uncontaminated equipment disposition
- 13 • Contaminated equipment disposition
- 14 • Transport pipe disposition between the LERF basins and the ETF
- 15 • Soil sampling and decontamination activities.
16

17 The following paragraphs discuss removal of the waste from the ETF and
18 decontamination or disposal of contaminated equipment and structures.
19

20 11.1.4.1 Inventory Removal. All of the waste inventory at the ETF will be
21 processed before closure. Any residue remaining in piping and equipment will
22 be removed in accordance with Section 11.1.4.4.
23

24 11.1.4.2 Uncontaminated Equipment. The ETF will contain some uncontaminated
25 structures including components such as the offices and conference rooms,
26 empty container storage area, and the mechanical room. Uncontaminated
27 structures will be left either for future use or disassembled, dismantled, and
28 removed for disposal.
29

30 11.1.4.3 Contaminated Equipment and Structures. The contaminated components
31 of the ETF will contain structures such as the surge tank, processing
32 equipment, decontamination shop, laboratories, hot maintenance shop, and
33 verification tanks. If contaminated with either dangerous or mixed waste
34 constituents, equipment and structures will be decontaminated and/or
35 disassembled, if necessary, packaged, and disposed of in accordance with
36 existing land-disposal restrictions (WAC 173-303-140).
37

38 11.1.4.4 Decontamination of Equipment. Initial final closure activities will
39 entail decontamination of all piping and equipment that have contacted
40 dangerous and mixed waste. Decontamination methods will be those methods
41 suitable for removing both dangerous and mixed waste contaminants. The
42 piping, pumps, containment structures, etc., first will be flushed with water.
43 Other decontamination methods, such as applying paint removers, sandblasting,
44 and aquablasting, could be used, depending on the success of the water flush.
45 The flush water will be collected, sampled, and analyzed to determine the
46 effectiveness of the decontamination and disposed of appropriately.
47 Procedures for cleaning and decontaminating equipment contained in the *Guide*
48 *for Decontaminating Buildings, Structures, and Equipment of Superfund Sites*
49 (EPA 1985), or other similar procedures, will be used as guidance.
50

51 11.1.4.5 Soil Sampling. The only possible sources of soil contamination will
52 be from an accidental spill or a leak from a pipeline, from containment

1 structures, and from the loading dock area for the filled container storage
2 area. Aboveground pipelines and tanks will be inspected daily and leaks or
3 spills will be detected with monitoring instruments. Operational practices
4 will require cleanup as soon as possible, given the nature of the spill or
5 leak.

6
7 A soil sampling program designed to detect the presence of contaminants
8 will be conducted at the end of cleanup operations. The soil sampling program
9 might use a hollow stem auger to drill to the sample depth followed by a
10 split-spoon sampler dropped through the hollow tube to collect samples. If
11 contamination is detected, the sampling effort will be extended to determine
12 the extent of contamination, and the contaminated soils will be removed and
13 disposed of appropriately. As a minimum, soil samples will be collected in
14 areas with documented or potential soil contamination, such as near
15 underground pipelines, storage tanks, or contaminated buildings.

16
17 11.1.4.6 Closure of Containers [I-1d(1)]. Containers will be used to contain
18 dangerous waste in the event of a spill, unexpected release, or equipment
19 failure. Containers will be used to accumulate nonradioactive dangerous waste
20 and/or mixed waste. Any containers used to contain dangerous and/or mixed
21 waste at the ETF will be disposed of in the appropriate manner. Containers of
22 dangerous and/or mixed waste will not be left in the ETF after closure.

23
24 11.1.4.7 Closure of Tanks [I-1d(2)]. Clean closure will consist of the
25 removal and disposal of all dangerous waste and the decontamination and/or
26 removal and disposal of contaminated equipment, including tanks. The ETF will
27 be designed to incorporate removable components. This design will facilitate
28 closure by allowing complete removal of equipment contaminated with dangerous
29 and mixed waste.

30
31 11.1.4.8 Closure of Waste Piles [I-1d(3)]. Operation of the ETF does not
32 involve the storage of dangerous waste in piles. Therefore, the requirements
33 of WAC 173-303-660 are not applicable to the ETF.

34
35 11.1.4.9 Closure of Surface Impoundments [I-1d(4)]. Operation of the ETF
36 does not involve the placement of dangerous waste in surface impoundments.
37 Therefore, the requirements of WAC 173-303-650 are not applicable.

38
39 11.1.4.10 Closure of Incinerators [I-1d(5)]. Operation of the ETF does not
40 involve the incineration of dangerous waste. Therefore, the requirements of
41 WAC 173-303-670 are not applicable to the ETF.

42
43 11.1.4.11 Closure of Land Treatment Facilities [I-1d(6)]. Operation of the
44 ETF does not involve the land treatment of waste. Therefore, the requirements
45 of WAC 173-303-655 are not applicable to the ETF.

1 11.1.5 Closure of Disposal Units [I-1e through I-1e(8)]
2

3 The ETF does not contain any waste piles, landfills, or surface
4 impoundments. In addition, the waste or contaminated materials will not
5 remain at the ETF closure site. Therefore, this section is not applicable to
6 the ETF.
7

8
9 11.1.6 Schedule for Closure [I-1f]
10

11 Operation is scheduled to begin in 1994 with the ETF designed for a
12 30-year operational life. Based on these assumptions, the expected year of
13 closure is approximately 2024. The actual year of closure will be controlled
14 by the time required for all waste being processed and could vary based on
15 future use of the unit, unforeseen factors, and operational requirements.
16

17 The projected closure schedule for the ETF will be examined periodically
18 and will be provided in a future permit modification.
19
20

21 11.1.7 Extension of Closure Time Frame [I-1g]
22

23 Until a detailed closure schedule is developed for the ETF, it will not
24 be possible to determine whether more than 180 days will be required for
25 closure. Unforeseen factors and operational requirements could impact the
26 closure schedule and could necessitate an extension beyond the 180-day period.
27 If final closure of the ETF cannot be completed within the 180-day period
28 allowed by regulations, a request for extension will be made.
29
30

31 11.1.8 Amendments to Closure Plan
32

33 Should changes be required to the approved closure plan, an amended plan
34 will be prepared and submitted to Ecology for approval in accordance with
35 40 CFR 264.112(c) and WAC 173-303-610(3)(a).
36
37

38 11.1.9 Certification of Closure and Survey Plat
39

40 Within 60 days of final closure of the ETF, the DOE-RL will submit a
41 certification of closure to the proper regulatory agency(s) in accordance with
42 40 CFR 264.115 and WAC 173-303-610(6). This certification will be signed by
43 both the DOE-RL and by an independent professional engineer, and will state
44 that the ETF has been closed in accordance with the approved closure plan.
45 The certification will be submitted by registered mail or an equivalent
46 delivery service. Documentation supporting the closure certification will be
47 retained and will be furnished to Ecology upon request to the proper
48 regulatory agency(s). This documentation will be maintained by the DOE-RL
49 contact (or the successor) identified in Section 11.9.
50

1 11.1.9.1 Closure Certification. The DOE-RL and the independent registered
2 engineer will certify that closure is complete with a document similar to
3 Figure 11-1.
4

5 11.1.9.2 Survey Plat. The ETF is planned to be clean closed. Because
6 dangerous waste will not be left in place following the operational period,
7 the requirement for producing a survey plat is not applicable to the ETF.
8
9

10 11.1.10 Notice to Local Land Authority

11
12 The ETF is planned to be clean closed. Because dangerous waste will not
13 be left in place following the operational period, the requirement for a
14 notification to the local land authority is not applicable to the ETF.
15
16

17 11.2 POSTCLOSURE PLAN [I-2]

18
19 The ETF is planned to be clean closed. Because dangerous waste will not
20 be left in place following the operational period, the requirement for
21 postclosure activities is not applicable to the ETF.
22
23

24 11.3 NOTICE IN DEED [I-3]

25
26 The ETF is planned to be clean closed. Because dangerous waste will not
27 be left in place following the operational period, the requirement for a
28 notice in deed is not applicable to the ETF.
29
30

31 11.4 CLOSURE COST ESTIMATE [I-4]

32
33 Federal facilities are not required to comply with WAC 173-303-620 as is
34 stated in the regulations. However, the DOE-RL has agreed to provide
35 projections of anticipated costs for closure of final status TSD units (i.e.,
36 those units that have been incorporated into the Hanford Facility Permit)
37 annually in a separate report (Chapter 12.0). Submittal of this report will
38 take place on October 30 of each year, starting with the year after the
39 issuance of the initial Hanford Facility Permit.
40
41

42 11.5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE [I-5]

43
44 In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this
45 section is not required for federal facilities. The Hanford Facility is a
46 federally owned facility for which the federal government is the operator, and
47 this section therefore, is not applicable to the ETF.
48

1 11.6 POSTCLOSURE COST ESTIMATE [I-6]
2

3 Federal facilities are not required to comply with WAC 173-303-620 as is
4 stated in the regulations. However, the DOE-RL has agreed to provide
5 projections of anticipated costs for postclosure for final status TSD units
6 (i.e., those units which have been incorporated into the Hanford Facility
7 Permit) annually in a separate report (Chapter 12.0). Submittal of this
8 report will take place on October 30 of each year, starting with the year
9 after the issuance of the initial Hanford Facility Permit.
10

11
12 11.7 FINANCIAL ASSURANCE MECHANISM FOR POSTCLOSURE CARE [I-7]
13

14 In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this
15 section is not required for federal facilities. The Hanford Facility is a
16 federally owned facility for which the federal government is the operator, and
17 this section is, therefore, not applicable to the ETF.
18

19
20 11.8 LIABILITY REQUIREMENTS [I-8]
21

22 In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this
23 section is not required for federal facilities. The Hanford Facility is a
24 federally owned facility for which the federal government is the operator, and
25 this section therefore, is not applicable to the ETF.
26

27
28 11.9 CLOSURE CONTACTS
29

30 The following office (or its successor) is the official contact for the
31 ETF.
32

33 Office of Environmental Assurance,
34 Permits, and Policy
35 U.S. Department of Energy,
36 Richland Operations Office
37 P.O. Box 550
38 Richland, Washington 99352
39 (509) 376-5441

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2
3
4
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CLOSURE CERTIFICATION
FOR

Hanford Facility
U.S. Department of Energy, Richland Operations Office

We, the undersigned, hereby certify that all _____
closure activities were performed in accordance
with the specifications in the approved closure plan.

Owner/Operator Signature DOE-RL Representative
(Typed Name)

Date

Signature Independent Registered Professional Engineer
(Typed Name, Professional Engineer license number, state of issuance, and date
of signature)

P.E.# _____

State _____

Date

Figure 11-1. Typical Closure Certification Document.

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12.0 REPORTING AND RECORDKEEPING

This chapter summarizes the ETF reporting and recordkeeping requirements. Required reports and records can be located through the RCRA Compliance Support organization by calling (509) 372-2804. Reports and records applicable to the Hanford Facility are summarized in Table 12-1.

12.1 NOTIFICATION OF DANGEROUS WASTE ACTIVITIES

Regulations require that facilities involved in the generation or transportation of dangerous waste or the owner or operator of a TSD facility have a current EPA/State identification number. The Hanford Facility is a single RCRA facility operating under EPA/State Identification Number WA7890008967. The ETF operates under this same EPA/State identification number.

12.2 TREATMENT, STORAGE, AND/OR DISPOSAL REQUIREMENTS

The TSD reports, the operating record and miscellaneous support records contents, and plans submitted with this permit application and maintained at the Hanford Facility are described in this section. The records and reports described in this section are available by contacting RCRA Compliance Support.

12.2.1 Reports

This section discusses the reporting requirements of WAC 173-303 and several parts of Title 40, Code of Federal Regulations relating to aspects of dangerous waste. The following are included in the reporting requirements:

- Waste manifest reports
- Annual dangerous waste reports
- Biennial dangerous waste reports
- Groundwater monitoring notifications
- Contingency plan incident reports
- Closure reports
- Postclosure reports.

Additional details of these reports are provided in the following sections. Copies of these reports are accessible by contacting RCRA Compliance Support.

12.2.1.1 Waste Manifest Reports. The Hanford Facility has methods in place for tracking offsite waste shipments using waste manifest. The waste manifest is the source of two possible reports, the manifest discrepancy report filed in accordance with WAC 173-303-370(4), and the unmanifested waste report filed in accordance with WAC 173-303-390(1). Methods of dealing with manifesting

discrepancies are described in Chapter 2.0, Section 2.8. Records documenting both onsite and offsite waste shipments are retained and are accessible by contacting RCRA Compliance Support.

12.2.1.2 Annual Dangerous Waste Reports. The state of Washington, pursuant to WAC 173-303-390, requires an annual overall report for each facility that holds an active EPA/State identification number. The report is due to Ecology by March 1 of each year. The report contents for the ETF will include the following:

- The EPA/State identification number
- Name and address of the Hanford Facility
- Calendar year covered by the report
- Sources of the waste treated and disposed of at the ETF
- Description and quantity of the waste received at the ETF
- TSD methods
- Certification statement signed by an authorized representative.

The report form and instructions in the "Waste Management Facility Annual Dangerous Waste Report-Form 5" are used for this report.

12.2.1.3 Biennial Hazardous Waste Reports. The EPA requires, pursuant to 40 CFR 264.75, that an overall report describing each dangerous waste facility activity be submitted on March 1 of each even-numbered year. Ecology has been extended administrative responsibilities for biennial reporting as required by 40 CFR 264.75. A specific biennial report is not prepared and submitted, because reporting requirements are satisfied by submittal of the annual report to Ecology.

12.2.1.4 Groundwater Monitoring Reports. The ETF is not operated as a dangerous waste surface impoundment, waste pile, land treatment unit, or a landfill as defined by WAC 173-303-645(1)(a). Therefore, no groundwater monitoring or reporting is required for the ETF.

12.2.1.5 Contingency Plan Incident Notifications. The building emergency director or coordinator, ETF line management, and the contractor's environmental protection organization are responsible for making the appropriate notifications (Chapter 7.0). Notifications of all emergency situations requiring contingency plan implementation will be made as required by 40 CFR 264.56 and WAC 173-303-360.

If the ETF stops operations in response to a fire, an explosion, or a release that could present a hazard to human health and the environment, the building emergency director or coordinator notifies the DOE-RL, via TSD unit line management, that the unit is operational and the emergency cleanup is complete.

The DOE-RL is responsible for three types of notifications: the incident assessment report, a 15-day report, and the TSD unit restart notification. Details of these notifications are provided in the following sections.

1 **12.2.1.5.1 Incident Assessment Report.** The Occurrence Notification
2 Center (509-376-2900) immediately will notify affected county emergency
3 management, Ecology, and the individual designated as the on-scene coordinator
4 for the southeastern Washington area of the National Response Center
5 (800-424-8802) if a fire, an explosion, or a release at the ETF could threaten
6 human health and the environment.

7
8 The report will contain the following information:

- 9
10 • Name and telephone number of reporter
11
12 • Name and address of the TSD unit
13
14 • Time and type of incident
15
16 • Name and quantity of material(s) involved to the extent known
17
18 • Extent of injuries if any
19
20 • Possible hazards to human health and the environment outside the
21 Hanford Facility.

22
23 **12.2.1.5.2 15-Day Report.** The DOE-RL will provide a written report to
24 Ecology within 15 days of any incident that requires implementation of the
25 contingency plan. The report will include the following:

- 26
27 • Name, address, and telephone number of the owner or operator
28
29 • Name, address, and telephone number of the TSD unit
30
31 • Date, time, and type of incident
32
33 • Name and quantity of material(s) involved
34
35 • Extent of injuries if any
36
37 • Assessment of actual or potential hazards to human health or the
38 environment where this is applicable
39
40 • Estimated quantity and disposition of recovered material that resulted
41 from the incident
42
43 • Cause of incident
44
45 • Description of corrective action taken to prevent recurrence of the
46 incident.

47
48 **12.2.1.5.3 Treatment, Storage, and/or Disposal Unit Restart**
49 **Notification.** If the ETF stops operations in response to a fire, an
50 explosion, or a release that could present a hazard to human health and the
51 environment, the DOE-RL will notify Ecology and the appropriate local

1 authorities before operations are resumed in the affected area(s). The
2 notification will indicate that cleanup procedures are complete and that
3 emergency equipment is clean and fit for its intended use.
4

5 **12.2.1.6 Closure Reports.** Reports regarding the closure of the ETF will be
6 made in accordance with the requirements of 40 CFR 264.115 and .116, and
7 WAC 173-303-610(6) and (9). These reports include notification of beginning
8 of closure and certification of closure.
9

10 **12.2.1.6.1 Notification of Closure.** Ecology will be notified in writing
11 at least 45 days before the date on which closure of the ETF is expected to
12 begin.
13

14 **12.2.1.6.2 Certification of Closure.** Within 60 days of completion of
15 closure, a certification signed by the DOE-RL and an independent registered
16 professional engineer will be submitted to the regulatory authority. The
17 certification will be sent by registered mail or an equivalent delivery
18 service. The certification will state that the ETF was closed in accordance
19 with the approved closure plan. Documentation supporting the independent
20 registered engineer's certification will be supplied upon request from the
21 regulatory authority.
22

23 **12.2.1.6.3 Survey Plat.** The ETF is not a disposal unit. This
24 determination eliminates the requirement for producing a survey plat.
25

26 **12.2.1.7 Postclosure Reports.** Postclosure reports required by 40 CFR 264.119
27 and .120, and WAC 173-303-610(9), (10), and (11) will not be required because
28 the ETF is not a disposal unit.
29

30 **12.2.2 Recordkeeping Requirements**

31
32 Records retained by the ETF include:

- 33 • Permit application plans
- 34 • Operating records
- 35 • Miscellaneous support records.
36
37
38

39 These records are described in the following sections. These records can be
40 located by contacting RCRA Compliance Support.
41

42 **12.2.2.1 Permit Application Plans.** A current copy of the plans contained in
43 this permit application that are incorporated into the Hanford Facility Permit
44 will be maintained in the operating record.
45

46 **12.2.2.2 Operating Records.** Operating records maintained at the ETF can be
47 located by contacting RCRA Compliance Support. These records include the
48 following:
49

- 50 • Description and the quantity of each dangerous waste received and the
51 method(s) and date(s) of treatment at the ETF in accordance with
52 40 CFR 264 Appendix I and WAC 173-303-380

- Location of each dangerous waste stored within the ETF and the quantity at each location
- Waste analyses results
- Inspection records
- Waste minimization certification
- Land disposal restriction records
- Groundwater monitoring records
- Contingency plan incident reports.

12.2.2.2.1 Waste Description and Quantity. A description and the quantity of each dangerous waste handled by the ETF unit are maintained. Waste manifests and onsite waste tracking records, describing the types and quantities of waste, are maintained as part of the operating record.

12.2.2.2.2 Waste Location. The location of each dangerous or mixed waste and the quantity stored within the ETF are documented and maintained. Transfers are documented on onsite waste tracking records and provided to other Hanford Facility TSD units receiving the waste. Copies of these onsite waste tracking records are maintained and can be located by contacting RCRA Compliance Support.

12.2.2.2.3 Waste Analysis. Waste analysis and designation records for the ETF are generated and maintained, as appropriate, for the following:

- Waste resulting from a spill or leak that cannot be identified
- Waste generated at the ETF during decontamination or maintenance activities if required.

As required, results of these analyses are provided to other TSD units subsequently receiving the waste for further treatment, storage, and/or disposal.

12.2.2.2.4 Inspection Records. Records of ETF inspections are maintained for a period of at least 5 years from the inspection date. These records can be located by contacting RCRA Compliance Support. The records include the following:

- The date and time of inspection
- The inspector's printed name and handwritten signature
- Notations of observations
- The date and nature of any repairs or other remedial actions.

1 **12.2.2.2.5 Waste Minimization Certification.** Annually a certification
2 by the DOE-RL that the Hanford Facility is in compliance with waste
3 minimization requirements is entered into the operating record as required by
4 40 CFR 264.73(b)(9).
5

6 **12.2.2.2.6 Land Disposal Restrictions Records.** Records related to
7 treatment and disposal of waste subject to land disposal prohibitions are
8 maintained by the Hanford Facility as required by 40 CFR 264.73(b)(10) and
9 (12). Possible records include:
10

- 11 • Waste placed in land disposal units under an extension to the
12 effective date of any land disposal restriction granted pursuant to
13 40 CFR 268.5
- 14 • Waste placed in land disposal units under a petition granted pursuant
15 to 40 CFR 268.6
- 16 • The applicable notice and certification required by 40 CFR 268.7(a) or
17 40 CFR 268.7(b)
- 18 • The demonstration and certification required by 40 CFR 268.8, if
19 applicable, for waste subject to land disposal prohibitions or
20 restriction.

21 An onsite waste tracking system is in place to document the transfer of
22 waste subject to land disposal restrictions. Land disposal restriction
23 documentation can be located by contacting RCRA Compliance Support.
24

25 **12.2.2.2.7 Groundwater Monitoring Records.** Groundwater monitoring
26 records are not applicable as the ETF is not operated as a surface
27 impoundment, waste pile, land treatment unit, or a landfill as defined in
28 WAC 173-303-645(1)(a).
29

30 **12.2.2.2.8 Contingency Plan Incident Records.** Records documenting the
31 details of any incidents requiring the implementation of the contingency plan
32 (Chapter 7.0) are maintained in the ETF operating record as required by
33 40 CFR 264.73 and WAC 173-303-380. The contingency plan incident records can
34 be located by contacting RCRA Compliance Support. In addition to these
35 records, occurrence reports are generated to document incidents. The
36 occurrence report describes all incidents, including those that are judged too
37 minor to require the implementation of the contingency plan but are identified
38 as offnormal events, unusual occurrences, or emergencies. These records can
39 be located by contacting RCRA Compliance Support.
40

41 **12.2.2.3 Miscellaneous Support Records.** Miscellaneous support records
42 include the following:
43

- 44 • Training records
 - 45 • Closure cost estimates
 - 46 • Certification records.
- 47
48
49
50
51

1 In addition, a rationale for the inapplicability of liability coverage
2 documentation is provided.
3

4 12.2.2.3.1 Training Records. The name of each employee and the waste
5 management position held are maintained by the ETF. Training records document
6 that employees have received the training required for that position.
7 Training records on current employees are kept until closure of the unit.
8 Training records on former employees are kept for 3 years from the date the
9 employee last worked at the ETF. Training records are maintained by the
10 contractors' organizations in accordance with the requirements of the *Privacy*
11 *Act*. Presently, the training records of individual employees are available
12 for inspection purposes through the *Freedom of Information Act*. The DOE-RL is
13 seeking authorization through the U.S. Department of Energy-Headquarters to
14 amend the systems notice under the *Privacy Act* to allow regulatory agencies
15 'routine use' access to training records under this act.
16

17 12.2.2.3.2 Closure and Postclosure Cost Estimates. In accordance with
18 40 CFR 264.140(c) and WAC 173-303, these estimates are not required for
19 federal facilities. The Hanford Facility is a federally owned facility for
20 which the federal government is an operator and these estimates are not
21 applicable.
22

23 An annual report updating projections of anticipated closure and
24 postclosure costs for final status TSD units (i.e., those units which have
25 been incorporated into the Hanford Facility Permit) will be submitted to
26 Ecology on October 30 of each year, starting with the year after the issuance
27 of the Hanford Facility Permit.
28

29 12.2.2.3.3 Certification Records. Reports, data, and information
30 requested or required in direct support of the Hanford Facility Permit will be
31 certified as required in accordance with WAC 173-303-810(12) and (13) or
32 40 CFR Part 2 and 40 CFR 270.11 for *Hazardous and Solid Waste Amendment*
33 provisions. Records of certification will be maintained as part of the
34 operating record.
35

36 12.2.2.3.4 Liability Coverage Documentation. In accordance with
37 40 CFR 264.140(c) and WAC 173-303, this documentation is not required for
38 federal facilities. The Hanford Facility is a federally owned facility for
39 which the federal government is an operator and this documentation is
40 therefore not applicable.
41

42 43 12.3 IMMEDIATE REPORTING 44

45 The DOE-RL verbally will report to Ecology and the EPA any noncompliance
46 with the Hanford Facility Permit that might endanger human health and the
47 environment. Any such information will be reported to Ecology and EPA within
48 24 hours after the DOE-RL becomes aware of the circumstances of the
49 noncompliance. The immediate verbal report will contain all the information
50 needed to determine the nature and extent of any potential threat to human
51 health and the environment.

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Table 12-1. Treatment, Storage, and/or Disposal Reports and Records.
(sheet 1 of 2)

Records and/or Reports	Regulation
Notification:	
Notification of dangerous waste activities	WAC 173-303-290
Permit Application Plans:	
Waste analysis plan	WAC 173-303-300
Contingency plan and amendments	WAC 173-303-350
Training plan	WAC 173-303-330
Closure plan	WAC 173-303-610
Inspection plans	WAC 173-303-320
Operating Reports and Records:	
Waste description and quantity	WAC 173-303-380 40 CFR 264, Appendix I
Waste location	WAC 173-303-380
Waste analysis	WAC 173-303-300, -380
Inspection records	WAC 173-303-320, -380
Waste minimization certification	40 CFR 264.73(b)(9)
Land Disposal Restriction Records:	WAC 173-303-140 40 CFR 264.74(b)(10), (11)
Extension to an effective date	40 CFR 268.5
Petition for a variance	40 CFR 268.6
Notice and certification of treatment standards	40 CFR 268.7(a) or 268.7(b)
Demonstration and certification for a temporary extension to the effective date	40 CFR 268.8
Waste Manifest Reports and Records:	WAC 173-303-370
Onsite waste tracking records	NR
Manifests	WAC 173-303-370
Manifest discrepancy	WAC 173-303-220, -370
Unmanifested waste	WAC 173-303-390
Contingency Plan Incident Reports and Records:	WAC 173-303-360, -380 40 CFR 264.56, 274.73
Incident assessment report	WAC 173-303-360
15-day report	WAC 173-303-360
TSD unit restart notification	WAC 173-303-360

Table 12-1. Treatment, Storage, and/or Disposal Reports and Records.
(sheet 2 of 2)

Records and/or Reports	Regulation
1 Closure Reports and Records:	WAC 173-303-610 40 CFR 264.115, .116
2 Certification of closure	WAC 173-303-610
3 Survey plat	WAC 173-303-610
4 Notice to local land authorities	WAC 173-303-610
5 Miscellaneous Support Reports and Records:	
6 Annual dangerous waste report	WAC 173-303-060, -070, -390
7 Training documentation	WAC 173-303-330

8 NR = no requirement.
9 TSD = treatment, storage, and/or disposal.
10

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13.0 OTHER RELEVANT LAWS [J]

This chapter provides a summary of the regulatory review performed to assist Ecology in determining that the ETF will meet its obligations with respect to other federal or state laws. The major environmental laws evaluated include the following, all as amended:

- *Atomic Energy Act of 1954*
- *Clean Air Act of 1977*
- *Clean Water Act of 1977*
- *Washington State Water Pollution Control Act (RCW90-48)*
- *Safe Drinking Water Act of 1974*
- *Endangered Species Act of 1973*
- *Fish and Wildlife Coordination Act of 1934*
- *National Historic Preservation Act of 1966*
- *Wild and Scenic Rivers Act of 1968.*

Full reference citations for each of these acts are included in Chapter 15.0.

13.1 ATOMIC ENERGY ACT OF 1954

The *Atomic Energy Act* provides that the U.S. Atomic Energy Commission (succeeded by the U.S. Department of Energy for conducting nuclear defense and research and development activities at the Hanford Site) is authorized to develop and implement regulations to govern activities related to the design, location, and operation of U.S. Department of Energy sites, to protect health, and to minimize danger to life or property. The radioactive component of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act*; the nonradioactive dangerous component of mixed waste is interpreted to be regulated under the RCRA and WAC 173-303.

The U.S. Department of Energy has issued several orders to govern the activities of its sites and to manage the health protection aspects of mixed waste. These orders provide for a consistent approach to managing waste that results from U.S. Department of Energy activities. The orders set radiation exposure limits and concentration guidelines to minimize exposure to radiation and detail the standards and procedures for managing mixed waste. The ETF operations are carried out in accordance with these orders.

13.2 CLEAN AIR ACT OF 1977

The *Clean Air Act* establishes national ambient air quality standards and sets standards for abating air pollution and preventing further deterioration of air quality. Air standards are implemented and enforced primarily by state

1 and local authorities. The ETF will comply with the applicable federal,
2 state, and local requirements to control and abate air pollution, including
3 the following:

- 4
- 5 • *National Emission Standards for Hazardous Air Pollutants* (40 CFR 61)
6 and *National Emission Standards for Radionuclide Emissions from*
7 *U.S. Department of Energy Facilities* (40 CFR 61, Subpart H); an
8 approval to construct application was submitted to the EPA.
9
- 10 • Air pollution control regulations (WAC 173-400 through 495) issued
11 under the authority of the *Washington Clean Air Act of 1967*; a Notice
12 for Approval to Construct a New Source for Toxic Air Pollutants was
13 received by Ecology February 12, 1993.
14
- 15 • *Radiation Protection-Air Emissions* (WAC 246-247), which promulgates
16 the policies set forth in Chapter 70.98 of the Revised Code of
17 Washington, *Nuclear Energy and Radiation*, issued under the authority
18 of the *Washington Clean Air Act*; a Radiation Protection-Air Emissions
19 notice of construction was approved by the Washington Department of
20 Health.
21
- 22 • Benton-Franklin-Walla Walla Counties Air Pollution Control Authority
23 general regulation 80-7 (1980).
24

25 26 13.3 CLEAN WATER ACT OF 1977

27
28 Operation of the ETF does not result in the discharge of effluent to a
29 surface water requiring a National Pollutant Discharge Elimination System
30 permit; therefore, no permits or reviews pursuant to the *Clean Water Act* are
31 applicable.
32

33 34 13.4 WASHINGTON STATE WATER POLLUTION CONTROL ACT

35
36 The preferred method to discharge treated effluent from ETF is to a
37 virgin soil column near the 200 West Area. A permit application for a State
38 Waste Discharge Permit, authorized by the *Washington State Water Pollution*
39 *Control Act*, 90.48 RCW and WAC 173-216, will be submitted according to the
40 Consent Order No. DE 91NM-177 between the DOE-RL and Ecology.
41

42 43 13.5 SAFE DRINKING WATER ACT OF 1974

44
45 The ETF does not treat water for drinking from the tap, nor does the ETF
46 discharge water near any surface or subsurface areas that surround drinking
47 water wells.
48

1 **13.6 ENDANGERED SPECIES ACT OF 1973**
2

3 The ETF is located in the 200 East Area of the Hanford Facility;
4 Chapter 2.0 provides site location information. The 200 East Area has been
5 developed extensively during past construction activities and during nuclear
6 fuel and chemical reprocessing activities. The site for the ETF cannot be
7 considered an undisturbed area or a major habitat for native plant and animal
8 species. Also, this area is a very small fraction of the Hanford Facility
9 and, hence, would not play a significant role in the ecology of the Hanford
10 Facility. No listed or proposed endangered or threatened species or their
11 habitats are expected to be affected by ETF activities or those activities
12 associated with sites used as material 'borrow areas' for future construction
13 of surface covers.
14

15
16 **13.7 FISH AND WILDLIFE COORDINATION ACT OF 1934**
17

18 Activities associated with the ETF do not involve the impoundment,
19 diversion, or other control or modification of any body of water. Therefore,
20 no permits or reviews pursuant to this statute are applicable.
21

22
23 **13.8 NATIONAL HISTORIC PRESERVATION ACT OF 1966**
24

25 The construction and pipe route areas were reviewed for cultural
26 resources by the Hanford Cultural Resources Laboratory. The Hanford Cultural
27 Resources Laboratory has declared the building and tank site clear of cultural
28 properties, but has identified two areas of concern with the proposed pipe
29 route to the 200 West Area point of discharge. One concern is the historic
30 White Bluffs Road, which is eligible for the National Register of Historic
31 Places, and the other is an anomalous rock cairn designated HT-39-030. The
32 Hanford Cultural Resources Laboratory cleared the ETF for construction
33 providing specific measures were followed during construction to mitigate or
34 avoid damage to both of these areas.
35

36 The ETF was reviewed for the presence of archaeological resources in
37 accordance with regulations issued pursuant to, or other requirements of, the
38 *American Antiquities Preservation Act of 1906*; the *American Indian Religious*
39 *Freedom Act of 1978*; the *Historic Sites, Buildings and Antiquities Act of*
40 *1935*; the *Archaeological and Historic Preservation Act of 1960*; and the
41 *Archaeological Resources Protection Act of 1979*.
42

43
44 **13.9 WILD AND SCENIC RIVERS ACT OF 1968**
45

46 The ETF will not affect any rivers presently designated under the *Wild*
47 *and Scenic Rivers Act*.
48
49

1 **13.10 OTHER REQUIREMENTS**
2

3 The DOE-RL has submitted a delisting petition to the EPA to 'delist'
4 certain hazardous waste constituents for which disposal is constrained by LDR
5 (40 CFR 124 and 260-271). Delisting of these constituents from the effluent
6 is necessary to discharge treated effluent to the soil. The EPA is evaluating
7 the petition.
8

9 The application of insecticides, herbicides, etc., on or in the immediate
10 vicinity of ETF, is conducted in compliance with the *Federal Insecticide,*
11 *Fungicide, and Rodenticide Act of 1975*, the *Toxic Substances Control Act*
12 *of 1976*, and the applicable provisions of the Washington State water quality
13 standards (WAC 173-201).

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14.0 CERTIFICATION [K] 14-1

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14.0 CERTIFICATION [K]

The following certification, required by WAC 173-303-810(13), for all applications and reports submitted to Ecology is hereby included:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner/Operator
John D. Wagoner, Manager
U.S. Department of Energy,
Richland Operations Office

8/25/93
Date

Co-operator
Thomas M. Anderson, President
Westinghouse Hanford Company

7/27/93
Date

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APPENDIX 2A

HANFORD SITE MAPS

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N510,000

N500,000

N490,000

N480,000

N470,000

18
N430,000
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N420,000
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N410,000
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N-Op
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N390,000
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N380,000
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LEGEND

.....	DRAWING GRID		A, B, C,
.....	COORDINATES		1, 2, 3
.....			N50,000p
.....			S40,000p
.....			W80,000p
.....	HANFORD LAND		
.....	COORDINATES		
.....			N510,000
.....	WASHINGTON STATE		2,190,000
.....	LAND COORDINATES		
.....			
.....	INTERSTATE ROUTE		82
.....			
.....	U. S. ROUTE		12
.....			
.....	WASHINGTON STATE ROUTE		24

POWER TRANSMISSION LINE

EXPORT WATER EW 7

HANFORD SITE BOUNDARY

BOAT LANDING ○

GATE □

MILEPOST ○

WASHINGTON STATE N510,000

LAND COORDINATES 2,190,000

INTERSTATE ROUTE 82

U. S. ROUTE 12

WASHINGTON STATE ROUTE 24

W80,000p

SITE PLAN

CONTOUR INTERVAL 20 FEET DATUM IS MEAN SEA LEVEL

THIS MAP WILL NOT BE USED FOR DETERMINING EXACT LOCATIONS

THIS MAP MUST BE OBTAINED FROM
 DIVISION, RCRA PERMITS SECTION
 WAS SUBMITTED WITH PERMIT
 THE WASHINGTON DEPARTMENT OF ECOLOGY.

NEXT USED ON: END ITS

OFFICIAL RELEASE
 BY WHC EDT-10111
 DATE MAR 17 1989

RS	5-11-93			DT	5/12/93	CTB	5/11/93	REVISED	ECN 1442
	11-20-91	11-20-91	11-20-91	DT	11/18/91	DT	11/18/91	REV. PER	ECN
REVISION APPROVALS								DESCR	
REVISIONS								DRAWING STATUS

DRAWING APPROVALS		DATE	U. S. Department of Energy	
APPD FOR QUALITY ASSURANCE			Richland Operations Office	
 APPD R.L. MARTELL		7/89	 Westinghouse Hanford Company	
 APPD K.D. JUNT		3/89	<h1>GENERAL OVERVIEW OF HANFORD SITE</h1>	
RESPONSIBLE ENGINEER R.L. MARTELL		3/89		
DRAFTING APPD K.D. JUNT		3/89	SCALE AS SHOWN	
CLASSIFICATION NONE		BY NOT REQ'D	INDEX NO. 0100	
LAST REV. 3		DRAWING NO. H-6-958	SHEET NO. 1	

8

7

E.575,750

F

6" EFFLUENT DISPOSAL

FIRE WATER LINE B

4" SW-PS

VERIFICATION

PIPE TRENCHES

E

7

6

CATION TANKS

E TRENCHES

ED DRUM
PAGE AREA

WINE
% C.

1

v

1 2 3 4

PAC
RAC

5

4

WIND ROSE FOR: 200E AREA
% CALM WINDS = .9

PERIOD COVERED
12/01/85 - 12/31/87
STATION NO. 6

N.137,750

PADDLES INDICATE DIRECTION WIND IS COMING FROM.
RADIAL GRIDS REPRESENT 5.0% AND 10.0% OCCURRENCE.

WIND CLASSMILES/HOUR

1-----
2-----
3-----
4-----
5-----

> 1.0 - 3.0
4.0 - 7.0
8.0 - 12.0
13.0 - 18.0
19.0 - 24.0

E.575.750

E.575.500

2

1

E.576,000

175.0

175.0

N.137,750

177.5

F

E

— VERIFICATION TANKS

— PIPE TRENCHES

— SEE PARTIAL PLAN

200 AREA EFFLUENT
TREATMENT FACILITY

PARTIAL

SCALE: 1:50

1 cm = 5 m
PHOTO DATE: 5
CONTOUR INTERVAL

30 METERS

ter

N

N. 137,000

WIND ROSE

N.137,500

N.137,250

E.575,500

CANTON AVE

LEC

E.576,250
N.136,000

WASHINGTON STATE COORDIN.
(METERS)

INTERMEDIATE

SITE PLAN

SCALE: 1:2000

LEGEND

- DINATES 216-A-42 CRIB
- 218-E-10 BURIAL GROUND

1 cm = 20 meters
 PHOTO DATE: 6-24-89
 CONTOUR INTERVAL: 0.5 meter

D

C

BOTTOM
017-153A
018-153S

N.137,250

LIQUID EFFLUENT
RETENTION FACILITY

RETENTION
BASIN

RETENTION
BASIN

E.576,000

AN

160 METERS

S
-89
meter

0081	SH	1 of 1	REV
			0

1 cm = 5 meters
PHOTO DATE: 6-24-89
CONTOUR INTERVAL: 0.5 meter

GENERAL NOTES

1. THIS MAP IS BASED ON AERIAL PHOTOGRAPHY FLOWN ON 6-24-89. THE TOP BY MERRICK & COMPANY AND CERTIFIED TO MEET NATIONAL MAP ACCURACY. OFFICIAL COPIES OF THE MERRICK MAPS THAT SHOW THE CERTIFICATE ARE LC ENGINEERING FILES AS DRAWING NUMBERS H-2-79476 SHEET 1 AND H-2-7 THE NAMES OF PHYSICAL FEATURES AND THE TITLE BLOCK OF THE H-13-00 MAPS WERE ADDED BY WESTINGHOUSE HANFORD COMPANY.
2. WASHINGTON COORDINATE SYSTEM: THE OFFICIAL STATE PLANE COORDINATE S' REVISED CODE OF WASHINGTON (RCW). THE HANFORD SITE LIES WITHIN THE SOUTH ZONE. THIS GRID COVERS THE ENTIRE SITE AND USES X (EASTINGS)

HORIZONTAL DATUM: NAD-83 LAMBERT PROJECTIONS

VERTICAL DATUM: NATIONAL GEODETIC SURVEY
DATUM AS PROVIDED BY KAISER
ENGINEERS HANFORD.
3. HANFORD PLANT GRID: A LOCAL GRID SYSTEM WITH ITS INITIAL POINT NOR- COVERS 200 EAST AND 200 WEST AREA AS WELL AS GENERAL SITE WORK S. GROUNDS. COORDINATES ARE SHOWN AS FEET. IT IS ROTATED FROM NORTH- DIFFERENT SCALE THAN LAMBERT.
4. THE PARTIAL PLAN SHOWS THE UNDERGROUND PIPELINES THAT TRANSFER WAS EFFLUENT RETENTION FACILITY TO THE 200 AREA EFFLUENT TREATMENT FACIL- PIPELINES TO THE VERIFICATION TANKS.

ster

S

THE TOPOGRAPHIC MAP WAS PREPARED
URACY STANDARDS.
ARE LOCATED IN THE WESTINGHOUSE
H-2-79477 SHEET 1 THRU 37.
-13-000201 THROUGH H-13-000237

INATE SYSTEM AS DEFINED BY THE
IN THE WASHINGTON COORDINATE SYSTEM,
STINGS) AND Y (NORTHINGS) COORDINATES.

SITE
SCALE:

NT NORTHEAST OF THE 400 AREA. IT
WORK SUCH AS WELLS AND BURIAL
NORTH AND IS ON A SLIGHTLY

FER WASTE FROM THE LIQUID
T FACILITY AND THE UNDERGROUND

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N.136,000
- WASHINGTON STATE CO
(METERS)
- INTERMEDIATE
CONTOUR
- INDEX CONTOUR
(METERS)
- 215.0
- FENCE
- POST & CHAIN FENCE
- PERIMETER FENCE
- DIRT ROAD
- PAVED ROAD
- BUILDINGS

PLAN
LE: NONE

DRAWING TRACEABILITY LIST		REFERENCES	
DWG NO	TITLE	REF NUMBER	TITLE
H-2-3329	PLAN AND PROFILE PUREX COOLING WATER DIS	H-13-000207	200E AREA TOPOGRAPHIC MAP
H-13-000200	200E AREA TOPOGRAPHIC MAP	H-13-000200	200E AREA TOPOGRAPHIC MAP
NEXT USED ON		H-13-000200

SITE

SCALE:

LEGEND

1 cm = 20
PHOTO DATE:
CONTOUR INTERVAL

HINGTON STATE COORDINATES	216-A-42	CRIB
ERS)	218-E-10	BURIAL GROUND
RMEDIATE	242-A	BUILDING
TOUR	2-E25-25	WELL
X CONTOUR	⊕	299-E25-25
ERS)	○ ^S	SIGNS
SE	○ ^{MH}	MANHOLE
& CHAIN FENCE	□ ^{CB}	CATCH BASIN
METER FENCE	⊗	TREES
ROAD	—+—+—+—	RAILROAD
D ROAD	⊙ ²⁴	STATE HIGHWAY
INGS	○	TANKS

PROFILE											
DOLING WATER DISPOSAL											
A											
HIC MAP											
A											
HIC MAP											
TITLE											
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REV NO	DESCRIPTION	REV BY DATE	CHK BY DATE	DFTG APVD DATE	COG ENGR	OTHER
REVISIONS						
CADFILE	N000081A	CADCODE	1B:IBM:ACD2:10.0:SS			

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60 METERS

DWG NO	H-13-000081	SH	1 of 1	REV	0
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JW VOSAHLO		DATE		12-28-92		U.S. DEPARTMENT OF ENERGY Richland Operations Office Westinghouse Hanford Company						
D. HAVENS		DATE		3-2-92								
R. N. Kuhl		DATE		3-2-93								
J. J. Holt		DATE		3/2/93								
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IMPLEMENTATION		SCALE		AS NOTED		EDT 136212		SHEET 1 OF 1				
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APPENDIX 3A

WASTE ANALYSIS PLAN

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This plan will be provided in a future permit application revision.

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APPENDIX 4A

ENGINEERING DESIGN REPORT

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This report will be provided in a future permit application revision.

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APPENDIX 4B

CERTIFICATION OF NEW TANK SYSTEM INTEGRITY

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DONALD B. MAUSSHARDT, P.E.
PROFESSIONAL ENGINEER

REGISTERED
VIRGINIA
MARYLAND
CALIFORNIA
OREGON

March 19, 1993

7705 FALSTAFF ROAD
McLEAN, VIRGINIA 22102
(703) 893-2921
(703) 893-9132 FAX

Mr. Ed Holton, Jr. P.E.
Project Manager
ADTECHS Corporation
2411 Dulles Corner Park, Suite 520
Herndon, VA 22071

REF: K-ETF Project - RCRA Independent Review

Dear Ed:

Attached is the completed RCRA Information Need Report covering the section 1.7.10.2 of the ETF Contract V-CO18HC1-001, Revision 0E. We have noted that all of the design documents diagrams and calculations have already been submitted to Kaiser Engineers Hanford. Hence, we did not include them with this report other than by reference. This report covers only the design of the RCRA related equipment.

There are two issues that we note in our discussion with you and your staff. They are:

- (1) Resolution of the LaQue Corrosion Report where there is a difference in the specifications of materials.
- (2) The long-lead vendor supplied items are currently undergoing design by your vendors for the package units. We have attempted to address this issue with the Section 2.2 of our report.

The remaining points that were discussed with your staff appear to have been corrected prior to our completion of this review.

Our team is composed of Engineers in the disciplines of Civil, Chemical, Electrical/Mechanical Engineering. As the team leader, I supervised the effort. A completed application for the Washington Professional Engineers License is before the State Board for Registration pending approval. The granting of a formal license should occur shortly. In the interim, according to the State code in Washington, Section RCW 18.43.130, I can fulfill the Registration requirements as specified in the contract until the license is formally granted.

Sincerely yours,

Donald B. Mausshardt, P.E.

HANFORD EFFLUENT TREATMENT FACILITY(ETF)

PROJECT NUMBER C-018H

INDEPENDENT RCRA INFORMATION NEEDS REPORT
AND CERTIFICATION FOR DESIGN ONLY

prepared by

DONALD B. MAUSSHARDT
PROFESSIONAL ENGINEER

March 22, 1993

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RCRA INFORMATION NEEDS

1.0 Introduction

1.1 System Description

The Effluent Treatment Facility (ETF) treats low-activity radioactive water containing small amounts of ammonia, inorganics, organics, and particulates. The waste water to be treated consists of the process condensate (PC) from the 242-A Evaporator, the process distillate discharge (PDD) and the ammonia scrubber distillate (ASD) from the PUREX plant, and waste water in the LERF basin which originates from the 242-A Evaporator PC.

The function of the ETF is to reduce those compounds to less than the level regulated by WHC-CM-7-5, and BAT requirements of the United States Department of Energy (DOE) Order 5400.5 and DOE Order 6430.1A. The ETF includes the following Main equipment, Secondary equipment, and Support systems:

Main Treatment Train

- Surge Tank
- Rough Filter
- UV Oxidation System
- pH Adjustment Tank
- H₂O₂ Decomposer
- Fine Filter
- Degasification System
- Reverse Osmosis System
- Polisher
- Effluent pH Adjustment Tank
- Verification Tank

Secondary Waste generated during treatment are treated with the following equipment

- Secondary Waste Receiving Tank
- Evaporator
- Concentrate Tank
- Thin Film Dryer
- Drum Handling system
- Resin Dewatering System

Supporting systems to the process units

- Chemical Reagent Feed System
- Sump Tank
- Vessel Off-Gas Treatment System
- Utilities

1.2 Basic Operating Philosophy

1.2.1 General

For safe ease of operation, the basic operating philosophy is:

- (1) Operation process inputs/outputs will be monitored in the Central Control Room.
- (2) Interlocking and sequential control will be provided.
- (3) Important process parameters will be controlled and regulated on a continuous basis.
- (4) Access to the control system will be classified and controlled for security.

1.2.2 Locations for Operation control

The control system will support operation control from three locations: Central Control Room, Local Control Unit(LCU), and Local Control Panel(LCP)

The central control room operation will be conducted via redundant CRT-based operation control system(OCS) consoles. In case of OCSs failure, the essential operation of the process will be conducted via LCUs supported by displays. Under normal operation the LCUs can be used to assist the operators.

Operation via the LCPs will be performed during preoperation testing and startup and during annual equipment maintenance.

1.3 Approach Employed to conduct the Assessment

This report is organized along the lines of the operating contracts that JGC/ADTECHS hold on the ETF Project. Section 1.7.10.2 RCRA Information Needs is the guiding format for this report. Several of the sections have been responded to separately with the submission of the 100% design documents by ADTECHS. The design diagrams and design calculations have already been submitted to ICF-Kaiser Hanford.

The approach employed to conduct this assessment was to develop fact sheets on each of 33 tanks and/or vessels. In order to cover those long lead items being purchased as package units, we also prepared a summary sheet of the package items showing the specifications, design criteria and vendor-delivered calculations for each unit. Additionally, to ensure compliance with applicable codes and standards, a review of design codes and standards was performed to assure completeness and application to the unit. The supporting specification used in this review was S-1222-005.

The Secondary Containment is covered in a separate section since the operation of the secondary systems encompass more than just individual tanks or vessels.

Separate sections are also presented for Handling Procedures, Testing Procedures for Tightness, and a Description of the Leak Detection System.

The Professional Engineering certification is enclosed along with the structural certification by a Registered Professional Structural Engineer.

1.2.3 Reference to codes and standards

In our review of the applicable codes and standards, the following documents were used as the key for verification with the codes and standards referred to in the ETF Contract. The primary document used was S-1136-001, Rev. 13. Document List, and S-1222-005 Applicable Codes and Standards. A check was performed on the procurement packages to ensure that the vendors were using the same codes and standards. A copy of the document list and codes and standards will appear in the appendix.

2.0 Information Sheets on Tanks, Vessels and Package Units

This section contains an information fact sheet on each of the 33 tanks and/or vessels. The information is presented in summary form and covers those items identified in Section 1.7.19.2.1 of the Contract Document V-CO18HC1-001, Rev. OE, Section 01010-53.

Also included for review is a tabular list of those long-lead items currently undergoing design. The information provided represents a status of the development of the vendor supplied package units.

Each tank and/or vessel has been numbered to assisting the review. The fact sheets presented were derived from ADTECHS files and vendor supplied documents all of which are on file at the ADTECHS Herndon Virginia Office.

2.1 Tanks and Vessels

Name: #1 Surge Tank
Equipment Number: 2025E-65A-TK-1

Purpose: Receiving/storing waste liquid, and pH adjustment to 6 for UV Oxidation system

Conditions: (1) Combined flow from four primary sources, viz. PDD, ASD, PC, and LERF
(2) Secondary streams from downstream process, viz. Polisher, evaporator, dryer, etc.

Construction material: Type 304 SS (UNS30400) and electropolished subsequently

Lining Materials: None

Tank Dimensions: 26' ID x 30'-1" H

Tank capacity: 100,000 gallons

Shell thickness: 3/16"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete ring beam plus concrete slab

Structural support: Saddle 304 SS, Support SS

Seams:

Connections: Flanged

Corrosion protection: Type 304 SS is acceptable

Remarks: Sloped bottom and installed inside secondary containment

Name: #2 pH Adjustment Tank
Equipment No. 2025E-60C-TK-1

Purpose: To adjust and maintain the process stream
pH to 4.0

Conditions: (1) Inlet flow: 170-171 gpm
(2) To provide retention time more than
15 minutes

Construction Material: Type 304SS and electropolished
subsequently

Lining Materials: none

Tank Dimensions: 10' ID x 8'-2" H

Tank Capacity: 2,600 gallons

Shell thickness: 1/4"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete slab

Structural support: Saddle support-material 304 SS

Seams:

Connections: Flanged

Corrosion protection: Type 304 SS is acceptable

Remarks: Equipped with an eductor.

Name: #3 Effluent pH Adjustment Tank
Equipment No. 2025E-60-TK-2

Purpose: To adjust and maintain the process stream
pH between 6.5 - 8.5

Conditions: (1) Inlet flow rate 152 gpm
(2) To provide retention time of more
than 15 minutes

Construction Material: Type 304SS (S30400) SA 240

Lining Materials: none

Tank Dimensions: 10' ID x 8'-2" H

Tank Capacity: 2,500 gallons

Shell thickness: 1/4"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete Pad on concrete slab

Structural support: Materials 304SS

Seams: Welded

Connections: Flanged

Corrosion protection: Type 304 SS is acceptable

Remarks: Equipped with an eductor

Name: #4 1st RO Feed Tank
Equipment No.: 2025E-60F-TK-1

Purpose: Receiving waste from degasification

Conditions: (1) Inlet flowrate: 169-171 gpm
(2) Recycle waste: 17 gpm

Construction Material: Type 304 SS (S30400) with internal surfaces to be electropolished.

Lining Materials: none

Tank Dimensions: 10' ID x 10'-7" H

Tank Capacity: 4,000 gallons

Shell thickness: 1/4"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete slab

Structural support: Saddle-material CS, Support material 304 SS

Seams: Welded

Connections: Flanged

Corrosion protection: Type 304 SS with electropolishing is acceptable

Remarks: none

Name: #5 2nd RO Feed Tank
Equipment No.: 2025E-60F-TK-2

Purpose: Receiving permeate from 1st RO Stage

Conditions: Inlet flow rate 163 gpm

Construction Material: Type 304 SS (S30400) with internal surfaces to be electropolished

Lining Materials: none

Tank Dimensions: 10' L x 5' W x 5' H

Tank Capacity: 2,000 gallons

Shell thickness: 3/16" with rib stiffeners

Pressure controls: Pressure Indicator

Foundation construction materials: Skid on concrete slab

Structural support: Saddle material CS, Support material 304SS

Seams: Welded

Connections: Flanged

Corrosion protection: Type 304 SS with electropolishing is acceptable

Remarks: none

Name: #6 Verification Tanks
Equipment No. 2025E-60H-TK-1A, 1B, 1C

Purpose: To receive and hold treated effluent
before discharge

Conditions: (1) Minimum of 72 hours capacity
(2) Inlet flowrate: 152-154gpm

Construction Material: Carbon Steel (CS) plus epoxy

Lining Materials: Epoxy

Tank Dimensions: 60' ID x 37'-6" H (each)

Tank Capacity: 670,000 gallons (each)

Shell thickness: 5/16"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete slab with 4" compacted
sand fill base

Structural support: Concrete ring beam

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends cathodic
protection as a complementary corrosion
control technique. As a alternate,
select type 316 Stainless Steel is
recommended.

Remarks: (1) Sloped bottom and installed inside
secondary containment outside building
(2) Equipped with an electric heater.
(3) One system will be undergoing
compliance testing, one system will be
discharging, and one system ill be
filling at any point in time.

Name: #7 Concentrate Tanks
Equipment No. 2025E-60J-TK- 1A, 1B

Purpose: Receiving evaporator concentrate

Conditions: (1) Evaporator concentrate: 0.41- 1.14 gpm
(2) Evaporator hold-up: 2,500 gallons
(3) To provide some additional capacity to be able to dilute the waste.

Construction Material: Type 316 SS (S31603) and subsequently electropolished.

Lining Materials: None

Tank Dimensions: 10' ID x 12'-6" H (each)

Tank Capacity: 5,000 gallons (each)

Shell thickness: 1/4"

Pressure controls: Pressure Indicator

Foundation construction materials: Concrete slab

Structural support: Mat foundation

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends Ni-Cr-Mo Alloy(e.g. N06625, N10276) in lieu of S31603

Remarks: Equipped with an eductor

Name: #8 92% Sulfuric Acid Storage Tank
Equipment Number: 2025E-65C-TK-1

Purpose: Store 92 Weight Percent Sulfuric Acid

Conditions: (1) Average flowrate to surge tank: 0.42gpm

(2) Regenerant of polisher: 1,075 gal/batch
(4 wt % H₂SO₄)

Construction materials: Carbon Steel plus Epoxy

Lining Materials: Epoxy

Tank Capacity: 7,500 gallon

Tank Dimensions: 10'-4" ID x 16'-4" H

Shell thickness: 3/8"

Pressure controls:

Foundation construction materials: Concrete slab

Structural support: Saddle-material CS, Support-material CS

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends Type
316 SS (S13603) material in lieu of CS

Remarks: (1) Install out-door
(2) Equipped with heat trace

Name: #9 5% NaOH Solution Tank
Equipment No. 2025E-65C-TK-4

Purpose: Dilute the NaOH from 50% to 5%

Conditions: (1) Feed rate to secondary waste tank:
0.003-0.09 gpm
(2) Regenerant for polisher: 862
gal/batch (4 w %)

Construction Material: FRP

Lining Materials: None

Tank Dimensions: 6' ID x 6'-10" H

Tank Capacity: 800 gallons

Shell thickness: 1/4"

Pressure controls:

Foundation construction materials: Concrete slab plus skid
mounted

Structural support: Support-material CS

Seams:

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends Type
304 SS in lieu of FRP

Remarks: Equipped with an eductor

Name: #10 4% H2SO4 Solution Tank
Equipment No. 2025E-65C-TK-3

Purpose: Dilute the H2SO4 from 92% to 4%

Conditions: Regenerant for polisher (4 wt % H2SO4)
1075 gallons/batch

Construction Material: FRP

Lining Materials: None

Tank Dimensions: 5'-6" ID x 6'-3" H

Tank Capacity: 600 gallons

Shell thickness: 1/4"

Pressure controls:

Foundation construction materials: Skid on concrete

Structural support: Support-material CS

Seams:

Connections: Flanged

Corrosion protection: FRP is acceptable

Remarks: Equipped with an eductor

Name: #11 50% NaOH Storage Tank
Equipment No. 2025E-65C-TK2

Purpose: Store 50% NaOH

Conditions: (1) Average flowrate to secondary waste
tank: 0.10 gpm
(2) Regenerant of Polisher: 862 gal/batch
(4 wt %)

Construction Material: Type 304 SS, SA 240

Lining Materials: None

Tank Dimensions: 5' ID x 5'-7" H

Tank Capacity: 5,000 gallons

Shell thickness: 1/4"

Pressure controls:

Foundation construction materials: Slab

Structural support: Support-material CS

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends low
carbon "L" grade material (i.e. S30403)

Remarks: (1) Install out-door
(2) Equipped with heat trace

Name: #12 Secondary Waste-Receiving Tanks
Equipment No. 2025E-65I-TK-1A, 1B

Purpose: (1) To receive waste from filter
backwash, RO condensate, and resin
generator.
(2) To adjust pH to around 6.

Conditions: (1) Receive polisher regeneration waste,
2540 gal/regeneration.
(2) Filter backwash, 185 gal/backwash
continuous inlet flow, RO concentrate
16.9 gpm

Construction Material: Type SS304 (S30400)

Lining Materials: None

Tank Dimensions: 14' ID x 18'-7" H

Tank Capacity: 15,000 gallons

Shell thickness: 1/4"

Pressure controls: Pressure Indicator

Foundation construction materials: Mat foundation concrete

Structural support:

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends a 6%
Mo- containing austenitic Stainless Steel
(e.g. S31254, N08367)

Remarks: Equipped with a eductor

Name: #13 Rough Filter
Equipment No. 2025E-60B-FL-1

Purpose: Rough removal of suspended solids

Conditions: Fed by stream no. 8 from the surge tank.
This stream is characterized by low Cl
(<2 ppm) and moderate TDS levels of 2000
ppm.

Construction Material: Type 304 SS (S30400)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: N/A

Pressure controls: Pressure Indicator

Foundation construction materials: Steel platform tied to concrete
slab

Structural support: Fabricated from angle

Seams: Welded

Connections: 150 lb. R.F. ANSI flanged

Corrosion protection: LaQue Corrosion Report recommended Type
316L Stainless Steel

Remarks: None

Name: #14 UV Oxidizer
Equipment No. 2025E-60D-UV-1A,1B & 2A,2B

Purpose: Decomposition of organic materials into
H2O and CO2

Conditions: Feed to the units is the cooled effluent
from the rough filter. It is treated
with a solution of 50% H2O2 (stream no.
11, pH 6, temperature 100 F) yielding a
product containing < 200 ppm H2O and a pH
of 4, which is then conveyed to the pH
Adjustment Tank.

Construction Material: Type 316 SS

Lining Materials: None

Tank Dimensions: 3' dia x 8' side w/F&D Heads

Tank Capacity: 1200 lbs

Shell thickness: 1/4"

Pressure controls: N/A

Foundation construction materials: Concrete floor

Structural support: Carbon steel and epoxy painted

Seams: Welded

Connections: Flanged- Threaded

Corrosion protection: Type 316 SS is acceptable

Remarks: none

Name: #15 H2O2 Feed Tank
Equipment No. 2025E-60D-TK-1

Purpose: Holds 50% H2O2 solution

Conditions: Atmospheric

Construction Material: High density polyethylene(PE)

Lining Materials: None

Tank Dimensions: ????????

Tank Capacity: 2,500 gallons

Shell thickness: Molded

Pressure controls: None

Foundation construction materials: Vendor supplied on skid tied to
concrete floor

Structural support: Skid

Seams: 1 pc.

Connections: Quick disconnect & socket- threads

Corrosion protection: High Density PE is acceptable

Remarks: None

Name: #16 H2O2 Decomposer
Equipment No. 2025E-60D-C01A, & C01B

Purpose: Decomposition of residual H2O2 injected
by the UV oxidation system

Conditions: Feed by stream no.13 from the pH
Adjustment Tank, which is low in
halides(<2 ppm), of moderate TDS (<3000
ppm) and a pH of 4. Discharges is
identical to the input except H2O2, which
is reduced from <200 ppm to <5 ppm.

Construction Material: Carbon Steel with epoxy coating

Lining Materials: Epoxy coating

Tank Dimensions: N/A

Tank Capacity: 2500 gallons

Shell thickness: TBD

Pressure controls: Pressure relief valve

Foundation construction materials: Skid on slab

Structural support: TBD

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommended S30403
or higher alloy material.

Remarks: none

Name: #17 Fine Filter
Equipment No. 2025E-60B-FL-2

Purpose: Final removal of suspended solids

Conditions: Receives process stream no. 14, the effluent of the H2O2 decomposer. Stream no. 14 has a TDS level ranging from 1650 ppm to 2800 ppm, a chloride level of <2 ppm and a pH of 4

Construction Material: Type 304 SS (S30400)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 3/16"

Pressure controls: ASME safety relief valve

Foundation construction materials: On steel platform

Structural support: Fabricated from angle

Seams: Welded

Connections: 150 lb. R.F. ANSI flanged

Corrosion protection: LaQue Corrosion report recommended using Type 316L SS

Remarks: none

Name: #18 Degasification Column Inlet Cooler
Equipment No. 2025E-60E-E-1

Purpose: Removal of dissolved carbonate to reduce
the load on reverse osmosis system and
polisher

Conditions: Used to cool stream no. 14 from 140 F to
86F after it passes through the fine
filter

Construction Material: Type 316 SS (S31600)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 1"

Pressure controls:

Foundation construction materials: Slab

Structural support:

Seams: Welded

Connections: Tack welded

Corrosion protection: LaQue Corrosion Report recommends a 6%
Mo-containing austenitic Stainless Steel
(e.g. S31254, NO8367)

Remarks: none

Name: #19 Degasification Column (Induced Draft)
Equipment No. 2025E-60E-C01

Purpose: Removal of dissolved carbonate to reduce
the load on the RO and polisher

Conditions: Receives stream no.15 which is the same
as the outlet of the H2O2 decomposer, but
cooled to 86F. Stripping reduces the
H2O2 level to <5 ppm. The CO2/CO3²⁻ and
TDS are further lowered.

Construction Material: FRP

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: Not developed as of this date

Pressure controls:

Foundation construction materials: Skid mounted by vendor

Structural support:

Seams: Resin and overlap

Connections:

Corrosion protection: LaQue Corrosion Report recommended Type
316L SS as preferable.

Remarks: None

Name: #20 Polisher
Equipment No. 2025E-60G-1X-1X,-1B,-1C

Purpose: Polishing of the waste water

Conditions: Receives waste stream no. 17 from the RO units. The waste stream is very low in TDS(15-32 ppm) with very low chloride present (<0.02 ppm). pH is 6.0. Stream temperature is <110F. The polisher uses the 4% H2SO4 as a regenerant for cations and 4% NaOH as a regenerant for anions.

Construction Material: Carbon Steel with Epoxy coating

Lining Materials: Epoxy coating

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 1/4"

Pressure controls:

Foundation construction materials: Skid mounted on concrete floor

Structural support:

Seams:

Connections:

Corrosion protection: Epoxy-coated carbon steel is acceptable

Remarks: none

Name: #21 Feed/Distillate Heat Exchanger
Equipment No. 2025E-60I-E-02

Purpose: Pre-heat the inlet stream no. 30 feed from the secondary waste-receiving tanks to the evaporator and cool the distillate(leading to stream no. 36) from the distillate tank in the evaporator system.

Conditions: Stream no. 30 has range of 8-17 ppm Cl, pH of 6, Temperature of 86F, and a TDS range of 10,000 to 25,000 ppm.

Construction Material: Type 316L SS (31603)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 0.049" wall tubing
2" schedule 10s shell

Pressure controls: PRV-133, PRV-131

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Flanged

Corrosion protection: S31603 is acceptable

Remarks: none

Name: #22 Vapor Compressor Inlet Silencer
Equipment No. 2025E-60I-C-01A

Purpose: Reduce pulsations of low pressure steam
entering the vapor compressor.

Conditions: 230F, 15psia

Construction Material: Type 316L SS (30400)

Lining Materials: N/A

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 1/4" (still in design by vendor)

Pressure controls: PRV-168, PRV-203

Foundation construction materials: Concrete floor

Structural support:

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommended a 6%
Mo-containing austenitic stainless steel
(e.g. S31254, NO8367)

Remarks: none

Name: #23 Vapor Compressor Outlet Silencer
Equipment No. 2025E-60I-C-01B

Purpose: Reduces the pulsations of low pressure
steam

Conditions: 230F, 75 psia

Construction Material: Type 304 SS (30400)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 1/4" (Still in design by vendor)

Pressure controls: PRV 168, PRV 203

Foundation construction materials: Floor mat on concrete slab

Structural support:

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommended a 6%
Mo-containing austenitic stainless steel
(e.g. S31254, NO8367)

Remarks: none

Name: #24 Evaporator Heater
Equipment No. 2025E-60I-E-01

Purpose: Heats evaporator feed

Conditions: 230F, 75psia

Construction Material: Alloy 625 (NO6625, tubes) and
electropolished Type 304 Stainless steel
(S30400, shell)

Lining Materials: N/A

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 3/16"

Pressure controls: PRV-168

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends Ni-Cr-Mo alloy (NO6625 for the shell-side of the heater).

Remarks: none

Name: #25 Entrainment Separator
Equipment No. 2025E-60I-DE-01

Purpose: Vapor from the evaporator passes through the entrainment separator before entering the vapor compressor. This unit removes carryover in the vapor (from the evaporator)

Conditions: 230F, 15 psia

Construction Material: Type 316L SS, electropolished internally after fabrication

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 3/10"

Pressure controls: PRV-168

Foundation construction materials: Skid mounted

Structural support:

Seams:

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommended a 6% Mo-containing austenitic stainless steel (e.g. S31254, N)8367; or Ni-Cr-Mo alloy (e.g. NO6625, N10276).

Remarks: none

Name: #26 Anti-Foam Tank
Equipment No. 2025E-60I-TK-04

Purpose: Prevents foaming inside vapor body

Conditions: Ambient temperature

Construction Material: High density polyethylene (PE)

Lining Materials: None

Tank Dimensions:

Tank Capacity: 50 gallons

Shell thickness: 1/8"

Pressure controls: Atmospheric

Foundation construction materials: Skid mounted

Structural support:

Seams: none

Connections: Flanged

Corrosion protection: High density PE is acceptable

Remarks: none

Name: #27 Thin-Film Dryer
Equipment No. 2025E-60J-D-01

Purpose: Produces dry powder waste

Conditions: Primary feed to the dryer is stream no. 33 from the concentrate tanks. This is a pH 4 liquid of high TDS(<400,000 ppm). The dryer is heated by the 370F steam from the boiler. Products from the dryer include a distillate and a powder waste.

Construction Material: Alloy 625 (N06625)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: N/A

Pressure controls: none

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Welded

Corrosion protection: LaQue Corrosion Report recommends a Ni-Cr-Mo alloy, such as N10276(or similar)

Remarks: None

Name: #28 Spray Condenser
Equipment No. 2025E-60J-DE-01

Purpose: Condenses water vapor from the thin film
dryer.

Conditions: 0.8 GPM, 210F

Construction Material: Type 316L SS (S31603).

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: 3/16" (note design not complete)
(specified to ASME Code)

Pressure controls: Automatic control plug valve

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Welded

Corrosion protection: LaQue Corrosion Report recommends a 6%
Mo-containing austenitic SS (e.g. S31254,
N08367) or a Ni-Cr-Mo alloy (e.g. N06625,
N10276).

Remarks:

Name: #29 Sump Tank
Equipment No. 2025E-20B-TK-1, -2

Purpose: Receiving liquid waste from tanks/equipment prior to sending it to the main treatment train.

Conditions: Receiving waste water irregular

Construction Material: Type SS304 and subsequently electropolished SA240

Lining Materials: None

Tank Dimensions: 60"L x 60"W x 94" H

Tank Capacity: 800 gallons

Shell thickness:

Pressure controls:

Foundation construction materials: In ground concrete slab and wall

Structural support: Reinforced concrete

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends a 6% Mo-containing austenitic stainless steel (e.g. S31254, NO8367).

Remarks: None

Name: #30 Distillate Condenser
Equipment No. 2025E-60J-CND-1

Purpose: Cools the spray condenser water which is
used to condense dryer water vapor.

Conditions: 250F, atmospheric

Construction Material: Type 304SS

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness:

Pressure controls:

Foundation construction materials: Skid mounted on concrete slab

Structural support:

Seams:

Connections:

Corrosion protection: Type 304SS is acceptable

Remarks: none

Name: #31 Powder Hopper
Equipment No. 2025E-60J-H-1

Purpose: Collects radioactive particulate and
feeds it into collection drums.

Conditions: Ambient conditions

Construction Material: Type 304SS

Lining Materials: None

Tank Dimensions:

Tank Capacity:

Shell thickness: 3/16" design not complete
Per ASME Code

Pressure controls: Stream control valve, auto, plug.

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Welded

Corrosion protection: Type 316L SS is acceptable

Remarks: none

Name: #32 UV Inlet Cooler(Plate Frame Heat Exchanger)
Equipment No. 2025E-60B-E-1

Purpose: Cools process water entering the UV Oxidizer.

Conditions: 140F, 150 psia

Construction Material: Type 316L SS

Lining Materials:

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness:

Pressure controls:

Foundation construction materials: On metal frame scaffolding

Structural support:

Seams: Welded

Connections: Tack welded and pressed

Corrosion protection: Not covered in LaQue Corrosion Report

Remarks: none

Name: #33 Vent Cooler
Equipment No. 2025E-60J-E-01

Purpose: Cools the air coming off the spray
condenser to remove liquid water.

Conditions: 250F, atmospheric

Construction Material: Carbon steel(H-2-89924) & Stainless
Steel(H-2-88989)

Lining Materials: None

Tank Dimensions: N/A

Tank Capacity: N/A

Shell thickness: Am Std SSSF 05024, 0.065" thick

Pressure controls: none

Foundation construction materials: Skid mounted

Structural support:

Seams: Welded

Connections: Welded

Corrosion protection: CS and SS are acceptable

Remarks: none

2.2 Vendor Supplied Units

For each of the long-lead vendor supplied units for the ETF facility, the units listed below are the long lead package units that are to be supplied by vendors. Condition were imposed upon the suppliers for material and structural integrity analysis. Secondly the materials specified appear to be compatible to the waste materials to be treated in the operable units..

List of procured units(package treatment)

Main System

- Rough Filters
- UV Oxidation & H2O2 Decomposer
- pH Adjustment Tanks
- Degasification System
- Reverse Osmosis System
- Polishers

Secondary System

- Evaporator System
- Dryer System
- Drum Handling System
- Resin Dewatering System

Each of the procurement packages were reviewed to verify that the design conditions were included as a part of the procurement. While several of the packaged units have been recently procured, presented in the attached table are the referenced specification used with each package unit. Where the vendors have provided information on the design or calculations we have so noted. It is also noted that much of the equipment is "off the shelf" and has been qualified via other applications in similar environments. The attached table summarizes the review of the package units.

INFORMATION SHEETS ON PACKAGE UNITS

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
ROUGH FILTERS	Pall Power Generation	R-135A-001	3		V-135A-001-301	
		S-1131-004	0		V-135A-001-302	
		S-1222-003	0		V-135A-001-303	
		S-1222-006	2		V-135A-001-304	
		S-1222-007	1		V-135A-001-305	
		S-135A-001	1			
		S-1370-101	0			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
		S-SECT 01650	OD			
		S-SECT 01730	OB			
		S-SECT 05120	OE			
		S-SECT 09805	OE			
		S-SECT 13440	CE			
		S-SECT 15491	OE			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
UV OXIDATION & H2O2 DECOMPOSER	Peroxidation Systems, Inc.	R-135A-002	1		V-135A-002-300	
		S-1131-004	0		V-135A-002-302	
		S-1222-003	0		V-135A-002-307	
		S-1222-006	1		V-135A-002-340	
		S-1222-007	1		V-135A-002-341	
		S-135A-002	0			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-005	1			
		S-1510-007	1			
		S-SECT 01650	1			
		S-SECT 01730	1			
		S-SECT 05120	1			
		S-SECT 09805	1			
		S-SECT 13440	1			
		S-SECT 15491	1			
		S-SECT 15493	1			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev. Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
ph ADJUSTMENTS TANKS	Clawson tank Co.	R-1354-001	1		V-1354-001-301	
		R-135A-005	3		V-1354-001-302	
		S-1131-004	0		V-1354-001-303	
		S-1222-003	1		V-1354-001-304	
		S-1222-006	2		V-1354-001-315	
		S-1222-007	2		V-1354-001-316	
		S-1312-001	1		V-1354-001-317	
		S-1351-001	0		V-1354-001-318	
		S-1354-001	0		V-1354-001-319	
		S-1370-101	3			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
DEGASIFICATION SYSTEM	McCormack Div. ARI Technologies, Inc.	H-2-88978	1			
		R-135A-007	1		V-1354-007-301	
		S-1134-004	0		V-1354-007-302	
		S-1222-003	1		V-1354-007-303	

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-1222-004	1		V-1354-007-304	
		S-1222-004	1		V-1354-007-305	
		S-1222-006	2		V-1354-007-306	
		S-1222-007	1		V-1354-007-307	
		S-1312-001	1		V-1354-007-308	
		S-135A-007	0			
		S-1370-101	3			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
		S-SECT 13440	OE			
		S-SECT 16400	OB			
REVERSE OSMOSIS SYSTEM	Zenon Environmental Systems	R-135A-003	1			
		S-1131-004			V-135A-003-301	
		S-1222-003			V-135A-003-302	
		S-1222-006				
		S-1222-007				

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-135A-003	0		V-135A-006-303	
		S-1370-101	0		V-135A-006-304	
		S-1380-101	1		V-135A-006-305	
		S-1510-003	1			
POLISHERS	Indeck Power Equipment	R-135A-006	1			
		S-1131-004	0			
		S-1222-003	0			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-006	0			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT 01650	0			
		S-SECT 01730	0			
		S-SECT 05120	0			
		S-SECT 09805	0			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
EVAPORATOR SYSTEM	Resources Conservation Company	DCN-1	0			
		R-135A-004	2		V-135A-004-303	
		R-135A-004	2		THROUGH	
		S-1131-004	0		V-135A-005-364	
		S-1222-003	1			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-004	2			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT 01650	OE			
		S-SECT 01730	0			
		S-SECT 05120	OE			
		S-SECT 09805	OE			
		S-SECT 13440	OE			
		S-SECT 15491	OE			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc
DRYER SYSTEM	LCI Corporation	S-1131-004	0			
		S-1222-003	1			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-005	1			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT. 01650	OE			
		S-SECT. 01730	0			
		S-SECT. 05120	OE			
		S-SECT. 09805	OE			
		S-SECT. 13440	OE			
		S-SECT. 15491	OE			
		S-SECT. 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
DRUM HANDLING SYSTEM	Pacific Nuclear Systems	H-2-88989	1		135Z-002-310	
		H-2-88990	0		135Z-002-370	
		H-2-89006	1		135Z-002-371	
		H-2-89008	0		135Z-002-375	
		H-2-89009	0		135Z-002-376	
		H-2-89128	0			
		R-135Z-002	1			
		S-1131-004	0			
		S-1222-003	0			
		S-1222-004	0			
		S-1222-006	1			
		S-1222-007	1			
		S-1312-001	0			
		S-135Z-001	1			
		S-135Z-002	1			
		S-1370-101	2			
		S-1370-102	1			
		S-1372-001	0			
		S-1372-002	0			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-1380-101	1			
		S-1510-006	2			
		S-1510-007	1			
		S-SECT. 13440	OE			
RESIN DEWATERING	TTI Engineering	S-135A-008	0			
		S-1222-006	1			
		S-1131-004	0			
		S-1370-101	2			
		S-1380-101	1			
		S-1510-006	2			
		SECTION 13440	OE			
		H-2-88990	0			
		S-1312-001	0			

- 3.0 Structural Integrity Certificate and Hazard Assessment
- 3.1 Review of Structural Integrity
 (To be Provided)

March 19, 1993

Project No. 212

File No. 6410

Mr. Donald B. Mausshardt, P.E.
7705 Falstaff Road
McLean, VA 22102

Re: 242-A Evaporator/Purex Plant
Process Condensate Treatment Facility
Structural Integrity Analysis - Independent Design Review

Dear Mr. Mausshardt:

In accordance with WAC 173-303-810 13, I, as a Licensed Structural Engineer in the State of Illinois, have reviewed the design calculations and drawings for the tanks, vessels and secondary containment listed below. My review was limited to verification of assumptions, methodology and reasonableness of results. I did not attempt to verify the correctness of mathematical computations.

My review was limited to the following documents:

1. a) Structural Design Calculations.
Document No. C-13G1-001, Revision 0, sheets 1-70, 97-127, 130-131, 136-140.
- b) Supplemental Calculations in Response to Review
Sixteen sheets transmitted by E. Hartsock, Adtechs, on 3-16-93.
Three sheets transmitted by E. Hartsock, Adtechs, on 3-17-93.
Five sheets transmitted by E. Hartsock, Adtechs, on 3-18-93.

2. Drawings.

<u>Drawing No.</u>	<u>Revision</u>
H-2-89063	1
H-2-89064	1
H-2-89065	1
H-2-89066	1
H-2-89067	1

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H-2-89068, Sheet 1 of 2	1
H-2-89068, Sheet 2 of 2	0
H-2-89069	1
H-2-89070	1
H-2-89071	1
H-2-89072	1
H-2-89073	1
H-2-89074	1
H-2-89076	1
H-2-89077	1
H-2-89078	1
H-2-89108	1
H-2-89109	1
H-2-89114	1
H-2-89115	1
H-2-89116	1
H-2-89119, Sheet 1 of 2	1
H-2-89119, Sheet 2 of 2	0
H-2-89120, Sheet 1 of 2	1
H-2-89120, Sheet 2 of 2	0
H-2-89121	1
H-2-89124, Sheet 1 of 2	1
H-2-89124, Sheet 2 of 2	0
H-2-89125, Sheet 1 of 2	1
H-2-89125, Sheet 2 of 2	0

The information provided me demonstrates the tanks and vessels have sufficient structural integrity for the materials placed in them. The design is adequate to ensure sufficient structural strength to meet design seismic events for Richland, WA for the vessels, tanks and secondary containment in accordance with the Uniform Building Code.

Very truly yours,

John E. Schmidt, P.E., S.E.
Principal Structural Engineer

Date 3/19/93
License Expires 11/94

3.2 Hazards Assessment

3.2.1 Introduction

The Hazards Assessment Document (Specification S-12HO-001) was reviewed for its completeness and inclusion of major RCRA related issues.

3.2.2 Hazard Concerns

The major issues covered in the hazard assessment are summarized below.

(1) The influent waste stream are mixed wastes containing hazardous materials at low concentrations.

(2) The chemical source term consists of tanks containing sulfuric acid, sodium hydroxide, and hydrogen peroxide. Low concentrations of volatile organic compounds (VOCs) are part of the source term and will be converted to hydrogen, oxygen and carbon dioxide by UV oxidation and H₂O₂.

(3) The operations area has a separate HVAC system from that of the ETF process area. During normal operations, the ETF ventilation systems are designed to maintain a negative pressure in the Radiologically Controlled Area (RCA) and Non-RCA areas. This will minimize gaseous environmental releases from the ETF into the operations area as a result of door openings. The ETF will utilize charcoal and HEPA filters to minimize the discharge of contaminants.

(4) Liquid releases will be controlled and sampled prior to authorized discharges. the ETF will use test tanks that will retain processed liquids until liquids are verified to meet discharge limits.

(5) The ETF employs designs that mitigate the severity of accidents or transients through the use of physical barriers such as dams, berms, drip pans enclosures, tents, and other barriers.

(6) The ETF employs instrumentation, monitoring, computer and communication systems to provide automatic shutdown controls, proper monitoring of system operation, interlocks, and communications to safely operate and maintain the facility.

A summary of the postulated hazard events and their potential consequences is presented in the attached table. The postulated hazard events have a very low probability of occurrence. Even so the analysis of the possible sequences, potential consequences, preventive features and mitigating features were fully addressed and commensurate with the 100% design documents.

3.2.3 References:

V-CO18HC1-001	Design Construction Specification ETF
H-2-88970	Process Flow Diagram
H-2-88970	Material Balance DB1
H-2-88971	Material Balance DB2
H-2-88973	Material Balance DB3
S-1223-001	System Description

Table 3-1 RCRA-Related Hazards Identification and Assessment

Event	Possible Sequence	Potential Consequences	Preventive Features	Mitigating Features
Liquid Spill	Equipment in operation Pressure boundaries fail, & residual liquid spills.	Personnel exposure	Bldg confinement training, use of berms/dams.	Relatively low operate pressure with exception of RO system
Corrosive Materials Cause Equip. Failure	Equip./piping failure occurs & containment is lost	Personnel exposure	Equip. materials selection, proper maintenance.	Early detection by inspection and/or monitors
Seismic Activity	Earthquake occurs & support facilities are disrupted; system equipment containment is lost.	Personnel exposure Equipment loss	Bldg acts as confinement.	Low energy (Pressure & Temp) systems
Containment Component Is Subject To Stress and/or Vibration	Stress/vibration causes fatigue and containment is lost.	Personnel exposure	Materials selection Planned maintenance	Early detection by inspect and/or monitors
Misrouting of Process Flow	Faulty design allows misrouting, overflow, etc.	Personnel exposure Environmental release	MCS fail safe; alarms & interlocks.	Tank level alarms; redundancy, operator training
Faulty Fabrication/ Installation	Fabrication/ installation is faulty and component fails	Personnel exposure; environmental release	QA; inspection, planned maintenance	Early detection by inspect/ monitors

Table 3-1 Continued

Chemical Reaction of Reagents	NaOH & H ₂ SO ₄ can react violently when mixed	Personnel injury; Equipment loss	Maintain separation of chemicals; color coding; training; opns procedures.	Metering and pH monitors
Exposure to Chemicals (VOCs)	Loss of ventilation system	Personnel injury	Design, inspection, and maintenance	Low conc. UV oxidizer converts VOC to H ₂ O ₂ and CO ₂
Chemical Vent System Fails	Room fills with corrosive vapors	Occupational injury	Non RCA ventilation system; redundancy of vital equipment	Very low concentration
Chemical Spills or Sprays	Personnel come in contact with chemicals.	Occupational injury Environ. release	Training; compliance with operating & maintenance procedures; use of berms and dams	Spill prevention plan; containment structure Shower/eye wash.
Chemically Induced Overpressure	Personnel come in contact with chemicals and VOCs	Occupational injury. Environmental release	Building contain; negative pressure maintained	Limited use of unstable chemicals Low conc.

4.0 Secondary Containment

Liquid process wastes containing radioactive or other hazardous materials are collected and monitored near the source of generation before batch transfer through pipe lines and tank transfer to the liquid waste treatment process area takes place. These wastes are collected in storage tanks. The waste storage tanks and transfer lines are designed and constructed so that any leakage is detected and contained before reaching the environment outside the process area.

The secondary containment system consists of the diked and drained concrete floor general process area designed to retain the capacity of the largest single vessel (15,000 gallons). In addition, individual containment areas surround the surge, verification, and external storage tanks.

4.1 Spill Containment in the Process Area

The spill containment design is recorded in document number C-13G1-001 and references drawing number H-2-89077. The capacity of the largest single vessel, in accordance with the Code of Federal Regulations, forms the basis for design. The largest vessels in the process area are the two secondary waste receiving tanks (2025E-601-TK-1A & 1B) each having a capacity of 15,000 gallons or 2005 cubic feet. The containment area consists of the process area of 12,000 cubic feet. The net containment area calculation is based on 80% of the area being occupied by equipment, and provides for 2400 cubic feet compared to the 2005 cubic feet requirement. This is a very conservative assumption since the clear floor area is closer to 50% of the gross area. The reinforced concrete floor is finished in accordance with the American Concrete Institute specification 301-89. The floor is uniformly sloped to the floor drains at 1/8 inch per foot. Spills in the process area flow to the drains and are collected in sumps and pumped to the surge tank thereby clearing the process area. All concrete and masonry surfaces in the process area are painted with an epoxy paint in three coats. The primer coat consists of Amercoat 187, the second coat Amercoat 33 and the finish coat is also Amercoat 33. This application protects, facilitates cleaning minor seeps, leaks and spills along with providing a measure of environmental protection. All concrete floor joints are sealed with Waterstop RX-101 to prevent leakage from the containment area.

4.2 Spill Containment - Verification Tanks

Three verification tanks (2025E-60H-TK-1A, 1B & 1C), are located apart from and on the north side of the processing facility, each with capacities of 670,000 gallons are surrounded by a secondary containment system. Design criteria for the volume to be contained is based upon containing 110% of one tank, or 108,383 cubic feet (737,000 gallons). The containment area, portrayed by drawing number H-2-89068, is a 236 by 88 foot rectangle, bounded by an 8 foot reinforced dike. The floor of the containment area is also

reinforced concrete. The available volume to contain the design volume is 142,032 cubic feet, which subtracts the area occupied by the tanks, leaving a volume well in excess of the minimum design objective. The dike and floor joints are water sealed with Waterstop RX-101. There is a scupper drain system and sump pump located in the foundation of the containment area which is manually activated to evacuate natural precipitation. The drain is normally closed. A detection/alarm system is located in the drain sump to signal the accumulation of fluid. The drain must be physically inspected and the contents surveyed by plant personnel before the evacuation pump can be activated to clear nonhazardous and nontoxic fluid from the containment area. Should hazardous or toxic fluid be discovered, plant personnel follow operating procedures dealing with the safe removal of such material.

4.3 Spill Containment - Surge Tank

The surge tank (2025E-65A-TK-1) is located outside the facility on a reinforced concrete foundation. The secondary containment area shares part of the southern wall of the main processing plant. The tank has a capacity of 100,000 gallons and stores waste liquid from the 242-A Evaporator/Purex plant waste streams. The tank is surrounded by a 60 foot square containment area defined by a 9.5 foot reinforced concrete dike. The volume available to contain 100,000 gallons, plus 10%, or 14706 cubic feet is over 28,000 cubic feet, satisfactory volume for containment. The floor, wall and dike joints are sealed with the Waterstop RX-101 seal and no drains are incorporated in the base of the containment area. The surge tank containment area is coated with the same epoxy paint referenced in the process area section for the purpose of sealing off contaminated fluid from seeping out of the area and providing a surface that can be cleaned in a safe and environmentally compliant way when dealing with seeps, leaks and spills of a minor nature.

4.4 Spill Containment - Sulfuric Acid Storage Tank

The H₂SO₄ storage tank (2025E-65C-TK-1) is located outside the facility adjacent to the south wall. A portion of the south wall is incorporated in the 20 by 24 foot containment area. The tank sits on a reinforced concrete floor surrounded by a 4 foot reinforced concrete dike. The volume to be contained is 7,500 gallons plus 10% as a design objective or 1,100 cubic feet. The volume available for containment is 1,920 cubic feet, a satisfactory volume. The joints in the dike, the union with the facility south wall and the floor joints are water sealed with Waterstop RX-101. The wall dike and floor are coated with epoxy paint to seal and provide environmental safeguards when remediating seeps, leaks or minor spills. No drains are incorporated in the secondary containment area.

4.5 Spill Containment - Sodium Hydroxide Storage Tank

The NaOH storage tank (2025E-65C-TK-2) is adjacent to the H₂SO₄ storage tank, also the south wall. The tank capacity is 5,000 gallons with the design objective 110% of this quantity or 736

cubic feet. The containment area is a 20 by 16 foot rectangle. The tank sits on a reinforced concrete floor and is bounded by a 4 foot reinforced concrete dike for an available volume of 1,280 cubic feet which will satisfactorily contain the design objective. The joints throughout the dike, wall and floor are water sealed with Waterstop RX-101. The concrete containment area is painted with Amercoat epoxy. The primer coat uses Amercoat 187, the second coat uses Amercoat 33, and the finish coat also is applied with Amercoat 33 for the purposes relating to seeps, leaks and minor spills. No drain is incorporated in this secondary containment area.

5.0 Handling Procedures Verification

An examination of the ADTECHS Inspection and Test Plan S-1510-005 revealed that a broad inspection and certification program is planned to require the suppliers and on-site personnel to inspect the tanks and ancillary equipment during manufacturing, shipping and receipt at the site. Specific sections of ADTECHS plan are noted and referenced below:

Weld Breaks	S-1510-005	Inspection Instruction II-001, Revision 1.
Punctures	S-1510-006	Note no specific reference however the item is inspected visually.
Scrapes of Protective Coatings	S-1510-005	Inspection instruction II-003, Revision 1. Instruction for visual Inspection of Painting.
Cracks	S-1510-005	Inspection instruction II - 008 , II - 009 , Instruction for visual inspection of Welds.
Corrosion	S-1510-006	Inspection instructions and specification for inspection requirements for Package Systems.
	S-1510-005	Inspection and Test Plan.
Structural Damage	S-1510-005 S-1510-007	Inspection and test plan. Specification for Non- Conformance Control.

5.1 Discrepancies

ADTECHS has addressed this issue under the Specification for Non-conformance Control. The reference document is Specification S-1510-007 which addresses the procedures for Identification, Control, and Resolution of Nonconformance Items. Additionally, the documentation and follow up to closure of the issue are presented in the specification.

6.0 Testing Procedures for Tightness

A review of the 100% documents in support of assuring that the equipment including tanks and vessels conform to tightness and demonstrate that they are leak tight are covered in Specification S-1510-005, Inspection and Test Plan. ADTECH's has developed procedures and specifications that requires the performance of hydrostatic, and pressure testing of all equipment both at the point of manufacturing and at the site when installed. Additionally, this testing will include performance tests to assure system operability and tightness.

For package systems, supplied by vendors, the Specification S-1510-006 will apply. This inspection requires that the vendor, witnessed by the Engineer(ADTECHS) to perform a Hydrostatic Test, a Mechanical test(Running) and a Performance test to assure meeting the specification. All of this will be performed at the vendors location prior to shipment to the field site. Specific inspection hold points and scope of inspections are found in Attachment A of S-1510.005.

For on site installation, the procedures for Inspection and Testing apply and require again the verification of tightness. This procedure will also apply to all ancillary equipment. Specification S-1510-005, Section II 007, Revision 1 addresses the onsite inspection and test program.

7.0 DESCRIPTION OF LEAK DETECTION SYSTEMS

7.1 Leak Detection-Primary Containment

The primary leak detection system must be able to detect the failure of the primary tank/vessel containment structure. This will be accomplished by a combination of the on-line Monitor and Control System(MCS), operator visual observation, periodic maintenance to prescribed procedures and appropriate training on the responses to alarm conditions.

The operating state of major equipment items such as pumps, blowers, tanks, etc. will be monitored through operator control stations(OCS's) of the MCS. Operating process parameters such as pressure, temperature, flowrate, level in the tank/vessel, etc can be monitored through OCSs.

An alarm system will be installed to annunciate the upset of the system to the operator. The operator will be required to take some action when an alarm is annunciated. In the central control room an alarm in the plant will be displayed on the CRT display. Also, in the central control room, important alarms will be individually displayed on the separately installed alarm display window. Every alarm will be displayed on the OCS. Also, the event printer of the MCS will print out the occurrence and nonoccurrence of alarms. Process data, such as liquid level, will be stored in the MCS historical file. Interlocks will be provided to prevent the lowering of the performance of systems, equipment, tank and vessel damage, and personal accidents, misroutings, etc. due to abnormalities of operating conditions.

Tanks and pumps will normally be monitored and controlled using the OCSs in the control room. In the case of OCS failure, the tanks and pumps can be controlled using the LCU display in the process area. Some system components will be duplicated in consideration of risk versus reliability. For example, the MCS I/O card servicing the sump tank level will be redundant to retain maintainability.

Table 7.1 below identifies the tanks and vessels that will be monitored/controlled by the MCS. Associated with the tanks and vessels are field devices to be utilized, device applications, and the function to be performed.

Table 7.1 Leak Detection, Primary Containment via MCS and Moniotrs

Tank Name	Device Category	Applications	Function
Surge	Level switch	Moisture detection	Alarm
NaOH Storage	Level switch	Moisture detection	Alarm
92% H2SO4 Storage	Level switch	Moisture detection	Alarm
H2O2 Feed System	Level switch	Moisture detection	Alarm
Sump Tank 2 Secondary Cont.	Level switch	Moisture detection	Alarm
Sump Tank 1 Secondary Cont.	Level switch	Moisture detection	Alarm
4% Solution	Level switch	Moisture detection	Alarm
Second-waste Receiving TK A	Level transmitter	Level indicator/control	Alarm/pump start
Second-waste Receiving TK B	Level transmitter	Level indicator/control	Alarm/pump start
Concentrate A	Level transmitter	Level indicator/control	Alarm/pump start
Concentrate B	Level transmitter	Level indicator/control	Alarm/pump start
Verification A	Level Switch	High level switch	Alarm
Verification B	Level Switch	High level switch	Alarm
Verification C	Level Switch	High level switch	Alarm

7.2 Leak Detection-Secondary Containment

The secondary systems outside the building have monitors located in their respective sumps of the secondary containment unit to monitor for moisture. Like wise the secondary units located inside the building for the tank noted (60D-TK1) has a moisture monitor to warn of a possible accumulation in the sump in secondary containment. On the floor of the main operations building at each sump in the floor there is a moisture monitor to advise of moisture accumulation. These features coupled with the level warning indicators associated with the tanks and vessels will alarm if a sudden loss occurs.

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified Personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who design the systems, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I also certify that I have a completed application before the Washington State Board of Engineering Examiners. Notification of a completed application was received dated February 5, 1993. According to the State Code RCW-18.43.130, I am signing this report as a Professional Engineer.

Signed

Donald B. Mausshardt

Donald B. Mausshardt, P. E.

Date

March 19, 1993

Appendix

- * Interoffice memorandum # 554 (attached)
- * Document List, Doc. No. S-1136-001, Rev 13, 37 pages
(cover sheet attached)
- * Applicable Codes and Standards, S-1222-005, 22 pages
(cover sheet attached)

INTEROFFICE MEMORANDUM #554

PROJECT K-ETF

DATE: March 11, 1993
TO: Ed Holton
FROM: Ed Hartsock
SUBJECT: Status of Anchorage Design of Vendor-Furnished Equipment
cc: D. Mausshardt
Ed:

In response to our conversations yesterday and today regarding the content of the structural anchorage calculations for vendor equipment, following is a brief summary of the current status.

- 1) In order to design their foundations, the verification tanks and the surge tank have been analyzed for their gross stability under seismic loading. No vendor fabrication drawings are as yet available to check anchor bolt loads. It is understood that such an analysis will be required upon complete submittal of vendor documents.
- 2) Vendor documentation on equipment anchorage has been submitted for both the LCI dryer and the RCC evaporator. Our foundations will be designed to accommodate these vendor-calculated loads. These foundations are currently on hold on the Issue for Construction drawings. I have reviewed these calculations and am willing to endorse them as an independent reviewer.
- 3) The secondary waste receiving tanks are the largest single components inside the ETF. For foundation design, gross stability was examined. However, as with other tanks, complete vendor information is not available for anchorage design.
- 4) The seismic design for typical "small" pieces of equipment, the plate and frame heat exchangers, has been submitted by the vendor. As in item #2 above, I am willing to endorse these submittals as an independent reviewer.

If we make our submittal to the regulators making the above information known and indicating that a process is in place to complete the designs once complete vendor information is available, I think the intent of the permit has been met.

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		SHEET 1 OF 37

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PROCESS CONDENSATE TREATMENT PLANT

REV.	DATE	PAGE	DESCRIPTION	PREP'D	APP'D
12	1-20-93	A11	Status as of January 20, 1993	RLS	E. F. Halber
13	2-22-93	A11	Status as of February 22, 1993	RLS	E. F. Halber
18	9-25-92	A11	Status as of September 25, 1992	RLS	E. F. Halber
19	10-20-92	A11	Status as of October 20, 1992	RLS	E. F. Halber
10	11-20-92	A11	Status as of November 20, 1992	RLS	E. F. Halber
11	12-22-92	A11	Status as of December 22, 1992	RLS	E. F. Halber

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①	3-3-92	Marked	Incorporate KEH Comments	<i>[Signature]</i>	<i>[Signature]</i>
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APPENDIX 4C

SEISMIC ANALYSIS

This report will be provided in a future permit application revision.

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APPENDIX 4D

CORROSION ANALYSIS

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This report will be provided in a future permit application revision.

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APPENDIX 7A

BUILDING EMERGENCY PLAN--200 AREA EFFLUENT TREATMENT FACILITY

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APPENDIX 7A

BUILDING EMERGENCY PLAN--200 AREA EFFLUENT TREATMENT FACILITY

The building emergency plan for the ETF will be provided in a future permit application revision. The building emergency plan for the ETF will be prepared before initial operation, after the final design and operating parameters have been established.

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APPENDIX 8A

TRAINING COURSE DESCRIPTIONS

APPENDIX 8A

CONTENTS

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8	8A.1 HAZARDOUS WASTE OPERATIONS TRAINING COURSES	APP 8A-1
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10	8A.2 UNIT-SPECIFIC COURSES	APP 8A-3
11		
12	8A.3 JOB-SPECIFIC COURSES	APP 8A-6

8A.1 HAZARDOUS WASTE OPERATIONS TRAINING COURSES

Title	Hazardous Communication and Waste Orientation
Description	Course usually is part of the new employee orientation and provides an overview of federal hazard communications programs and hazardous waste disposal requirements.
Target audience	All employees
Delivery	Classroom
Evaluation	Not applicable
Length	1 hour
Frequency	Not applicable
Title	Generator Hazards Safety Training
Description	Course is designed to introduce workers to the 'right-to-know' laws governing chemical safety in the work place. The course provides the hazardous material/waste worker with the basic fundamentals for safe use and disposal of hazardous material. Course defines hazardous material, reviews labeling requirements, and introduces material safety data sheets and key terms used in chemical safety. The course also introduces methods for waste minimization and reviews the cycle of a chemical from the manufacturer to processing and storage as a hazardous waste.
Target audience	General worker, general supervisor/manager, and general nonradiological shipper
Delivery	Classroom
Evaluation	Written examination
Length	4 hours
Frequency	2 years

1	Title	Facility Emergency and Hazard Information Checklist Training
2	Description	Course consists of a review of specific hazards associated with the TSD unit and employee's job. The training is completed by the supervisor or manager using a checklist. The supervisor or manager reviews job-specific information concerning hazards in the employee's work area. The checklist act as a guide to ensure consistent coverage of necessary topics.
3	Target audience	General worker, general supervisor/manager, and general nonradiological shipper
4	Delivery	One-on-one or as a group with supervisor or manager
5	Evaluation	Training checklist documentation
6	Length	Average - 4 to 6 hours
7	Frequency	1 year
8	Title	Hazardous Waste Shipment Certification
9	Description	Course takes an in-depth look at federal, state, and management requirements for nonradioactive hazardous waste management. Participants are given specific instruction by subject matter experts in each area covered. Each participant receives the federal, state, and management documents governing the management of hazardous waste. Course focuses on use of the material provided while the instructor is available to facilitate and answer questions. Successful completion prepares the participant to complete and sign the EPA's hazardous waste manifests.
10	Target audience	General nonradiological shipper
11	Delivery	Classroom
12	Evaluation	Open-book written examination
13	Length	24 hours
14	Frequency	1 year

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8A.2 UNIT-SPECIFIC COURSES	
Title	Hanford General Employee Training
Description	Course covers DOE orders and applicable policies pertaining to employer and employee rights and responsibilities, general radiation training, hazardous communications, and hazardous waste, fire prevention, personal protective equipment, safety requirements (including TSD unit orientations), accident reporting, and avenues for addressing safety concerns.
Target audience	All employees
Delivery	Computer-based training with interactive video
Evaluation	Computer generated questions
Length	Average = 2 to 6 hours
Frequency	12 months
Title	New Employee Safety Training
Description	Course covers DOE orders and applicable policies pertaining to employer and employee rights and responsibilities, general radiation training, hazardous waste, fire prevention, personal protective equipment, safety requirements, accident reporting, and avenues for addressing safety concerns.
Target audience	All new employees
Delivery	Classroom
Evaluation	Not applicable
Length	3 hours
Frequency	Not applicable

1	Title	Building Emergency Director Training
2	Description	Course provides an overview of the responsibilities of the building emergency director, identifies the building emergency organizations, reviews building emergency plan, and discusses drill and exercise requirements.
3	Target audience	Primary and alternate building emergency directors and members of a building emergency organization
4	Delivery	Classroom
5	Evaluation	Written test
6	Length	2 hours
7	Frequency	1 year
8	Title	Building Emergency Plan Checklist (Appendix 7A)
9	Description	Course provides the information managers are required to discuss with employees. The checklist is contained in the building emergency plan. The building emergency plan covers designated TSD units.
10	Target audience	All TSD unit employees, including subcontractor personnel
11	Delivery	Classroom
12	Evaluation	Not applicable
13	Length	Average = 2 hours
14	Frequency	1 year

1	Title	Treatment, Storage, and/or Disposal Unit Orientation
2	Description	Course consists of classroom presentation. Topics are presented according to DOE, federal, and state requirements that include entry and exit requirements; location of organizational charts and administrative and operating procedures; the person in charge of communications; potential hazards (radiological and nonradiological); restricted areas; potential emergencies, alarms, communications, responses and staging areas; locations and use of personal protective and emergency equipment; identification of TSD units; overview of the process; and training requirements.
3	Target audience	All personnel assigned to or performing work in TSD units
4	Delivery	Classroom
5	Evaluation	Not applicable
6	Length	1 hour
7	Frequency	Initial; 1 year; 2 years as determined by TSD unit management

8

8A.3 JOB-SPECIFIC COURSES

Title	Treatment, Storage, and/or Disposal Unit-Specific Training
Description	Course is designed to establish a general understanding and comprehension of TSD unit operations.
Target audience	Nuclear operators and nuclear process operators
Delivery	Self-study and on-the-job training
Evaluation	Written test and on-the-job training checklist
Length	Average = 80 hours
Frequency	1 year for nuclear operator level and 2 years for nuclear process operator level
Title	Treatment, Storage, and/or Disposal Unit Nuclear Operator Certifications
Description	Courses are designed to prepare and certify TSD unit nuclear operators and nuclear process operators for TSD unit operations. The TSD unit supervisors and managers complete designated courses when determined by management. Courses are designed, developed, implemented, and documented based on job and training analysis.
Target audience	Nuclear operators, nuclear process operators, and TSD unit operations supervisors and managers when required by TSD unit management
Delivery	Classroom, self-study, and on-the-job training
Evaluation	Written test and on-the-job training checklist
Length	Average = 200 hours
Frequency	2 years

1	Title	Treatment, Storage, and/or Disposal Unit Nuclear Operator Emergency Procedures and Abnormal Conditions Training
2	Description	Course consists of a review of offnormal and emergency conditions that could occur in the TSD unit (associated alarms and communications) and proper responses.
3	Target audience	Nuclear operators and nuclear process operators
4	Delivery	Self-study and on-the-job training
5	Evaluation	Written test
6	Length	Average = 20 hours
7	Frequency	1 year
8	Title	Treatment, Storage, and/or Disposal Unit Operations Supervisors and Managers Certification
9	Description	<p>Course includes the following topics (topics could vary for each TSD unit):</p> <ul style="list-style-type: none"> • Administrative information • Technical information • Hazardous material waste requirements • Safety analysis reports • Operational safety requirements • Handling dangerous waste • Radiation work procedures • Occurrence reporting • Jobs conducted in the area of assigned responsibility • Conduct of operations • Processes and services • Equipment.
10	Target audience	Operations supervisors and managers
11	Delivery	Self-study and on-the-job training
12	Evaluation	Written test and on-the-job training checklist
13	Length	Average = 40 to 80 hours
14	Frequency	2 years

1	Title	Treatment, Storage, and/or Disposal Unit Operations Supervisors and Managers Emergency Procedures and Abnormal Conditions Training
2	Description	Course is designed to be a review of offnormal and emergency conditions that could occur in the TSD unit (associated alarms and communications) and proper responses in the following areas: <ul style="list-style-type: none"> • General • Unit • Processes and services • Equipment.
3	Target audience	Operations supervisors and managers
4	Delivery	Self-study and on-the-job training
5	Evaluation	Written test
6	Length	Average = 20 hours
7	Frequency	1 year
8	Title	Phase I Process Engineering Certification (Site-Generic Training)
9	Description	Phase I training covers general information concerning TSD unit processing operations. The following topics are covered: <ul style="list-style-type: none"> • Radiological controls • Accident prevention standards • Management policies • Environmental protection • Packaging and shipping hazardous material and radioactive waste • Engineering procedures (configuration control, document control, and design media control) • Selected quality assurance procedures.
10	Target audience	Process engineers
11	Delivery	Classroom and self-study
12	Evaluation	Written test
13	Length	Average = 20 hours
14	Frequency	Not applicable

1	Title	Phase II Process Engineering Certification (Unit-Specific Training)
2	Description	Phase II training covers generic information for a specific TSD unit. The following topics are covered: <ul style="list-style-type: none"> • Unit processes • Unit utilities.
3	Target audience	Process engineers
4	Delivery	Self-study
5	Evaluation	Written test and oral walkthrough
6	Length	Average = 40 hours
7	Frequency	2 years
8	Title	Phase III Process Engineering Certification (Process-Specific Training)
9	Description	Phase III training covers detailed information on 'specialized' areas within a given TSD unit; in this case, the information is determined based on job and training analysis. Topics covered include details of the following: <ul style="list-style-type: none"> • Process flowsheet • Operating specifications • Process equipment • Operating procedures.
10	Target audience	Process engineers
11	Delivery	Self-study
12	Evaluation	Written test or oral walkthrough
13	Length	Average = 40 hours
14	Frequency	2 years

1	Title	Treatment, Storage, and/or Disposal Unit Process Engineering Emergency Procedures and Abnormal Conditions Training
2	Description	Course is designed to prepare engineers to be able to recognize offnormal and emergency conditions that might occur in the TSD unit, associated alarms and communications, and proper responses. The following topics are presented: <ul style="list-style-type: none"> • Emergency procedures • Offnormal conditions and responses • TSD unit status • Criticality prevention standards • Desk instructions • TSD unit/assigned area familiarity • Operating procedures and documentation • Unusual/offnormal documentation.
3	Target audience	Process engineers
4	Delivery	Self-study
5	Evaluation	Written test
6	Length	Average = 20 hours
7	Frequency	1 year
8	Title	Treatment, Storage, and/or Disposal Unit Emergency Procedures and Abnormal Conditions Training
9	Description	Course is designed to be a review of offnormal and emergency conditions that could occur in the TSD unit (associated alarms and communications) and proper responses. The following topics are presented: <ul style="list-style-type: none"> • General • Unit • Processes and services • Equipment.
10	Target audience	Employees designated by immediate management and TSD unit management
11	Delivery	Self-study and on-the-job training
12	Evaluation	Written test
13	Length	Average = 20 hours
14	Frequency	1 year
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